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EDITORIAL NOTES.

"A Scrap of Paper," and Other Matters.

FOLLOWING up the review [commenced in last week's issue] of the, for the gas industry, chief legislative events of the past parliamentary session, the next important question was the reappearance of the chemical manufacturers against the restoration of the liberty that the South Suburban and Swansea Gas Companies desired, in accordance with the judgment of the Joint Committee appointed to settle the controversy raised over the question of open markets for the secondary products of gas manufacture. The gas industry looks upon the judgment as definitive for the guidance of the parliamentary authorities and committees and for its own protection; but the parliamentary authorities look upon it, like the German Imperial Chancellor upon the guarantee of the neutrality of Belgium, as nothing more or worthier than "a scrap of paper." Because Germany thinks so, this country is at war; and the gas industry will not rest content until the parliamentary authorities ensure to it the right that the Joint Committee expressly said should be its—that is, complete freedom in its dealings in all the secondary products of gas manufacture. As it is, in the two cases mentioned, the session saw a mitigation of the disability placed upon the Companies, but only to the extent of freedom in dealings with other gas undertakings up to one-third of their own production.

This is an abuse of the Joint Committee's verdict; and it is an abuse that appears to be (it is impossible for gas men to think otherwise) the result of—interpreting literally statements made before Parliamentary Committees in the course of the session on behalf of the chemical manufacturers—certain proceedings behind the back of the gas industry. The industry accepted the Joint Committee as a tribunal that would hear the whole of the evidence bearing upon the controversy that could be advanced from either side, and by the decision of the tribunal they determined to honourably abide. But what of the chemical manufacturers? It transpired during the session that the spirit in which they entered upon the inquiry was "Heads we win; tails you lose." And when they found they had lost, they again set to work—not this time in the open, and in face of the gas industry which had stood up to a square fight, and had won, but manifestly behind the back of the industry? If this is not what they did, then what is the construction to be placed upon the words of Mr. Macassey, K.C., that the Alkali Manufacturers' Association were still determined, through Model Clauses and Standing Orders, to get the prohibition they desired placed upon the gas industry? Months before this statement was made, the model clause had been altered in anticipation of last session's work, and in a manner which did not give effect to the Joint Committee's report, but which well suited the chemical manufacturers. At whose instance was this done? Who was it who consented to tear up as a worthless "scrap of paper" (to again apply the term that did not disturb the Hollwegian brand of honour) the report of the Joint Committee, and to put something in its place that was diametrically opposed to the findings of the Committee, and so was in favour of the losers of the fight? It may be left to those concerned in this matter to say whether their action was fair. That it was not was not said in as many words by the Select Committees before whom the South Suburban Company's and the Swansea Company's Bills came, but the one-third limitation shows at all events that the majority of the members of these Committees could not support the model clause, nor disregard entirely the Joint Committee's report, though fully conscious that they were not carrying out the findings either in the spirit or the letter. This is a matter over which the gas industry declines to be silent; and it will be reopened again and again, in all possible places and manners, until the principle of complete freedom for their secondary products markets, in the terms of the Joint Committee's report, is recognized and protected by Parliament.

During the session, there was a great deal of discussion over the granting to gas companies of electricity supply authorization. The South Suburban Gas Company dropped their proposed powers; but no one can prevent them, if they so choose, supplying current to tenants on their own property. The Alliance and Dublin Gas Company did not secure powers in respect of Kingstown, Blackrock, and Dalkey; but the Dublin South Electric Supply Company obtained powers in respect of Kingstown, with, in the event of the Kingstown Corporation taking over the supply, the "Northumberland Clause" applying. The Newport (Mon.) Corporation had a proposed extension of their electricity supply area beyond their jurisdictive limits knocked on the head through the intervention of the Gas Company. The Leyland Gas Company lost their contemplated electricity scheme. With these exceptions, there was success. The Brentford, Deal and Walmer, and other companies secured powers of electricity supply, in face of some opponents who illogically thought that, even in districts not strong enough to support competing companies, competition would be better for the communities than the economies of concentration and single management. The Ashington District Council successfully sought to relieve their district (mostly occupied by miners) from what was practically a monopoly of lighting by electricity, by bringing forward a complete gas-works scheme. There was strenuous opposition from the electricity suppliers, who showed genuine fear of the gas project. The Middlesbrough Corporation got their proposals through for the purchase of the North Ormesby Gas Company, and the utilization of gas to be drawn from a local coke-oven plant. The Thornaby-on-Tees Bill was not proceeded with. While the South Suburban Gas Company secured their new site at Belvedere, the Brentford Company failed over theirs at Chiswick. Except the suggested amalgamation of the Margate and Broadstairs Companies, schemes for fusion and annexation in other instances were all ratified.

County Councils made further attempts to have onerous terms imposed in connection with pipe work in main roads and over bridges; but where there was resistance, no real success was achieved, as Committees would not hear of any trespass beyond the general law which would give County Councils undue advantage. A very interesting fight was that which the Brentford Company put up for the provision of adequate accommodation for their pipes in the new Western Road out of London. The Middlesex County Council want to make this road in a manner befitting modern traffic, and do not desire to have its crust disturbed by pipe or cable work. They therefore propose that all pipe and cable owners shall have accommodation under the footpaths with transverse pipes or cables running through tunnels. The Gas Company did not succeed in their efforts to obtain further provision, and so must make the best of the designed conditions. Minimum gas pressures have been raised in the case of the Margate Company to 20-10ths, in that of the Skegness Company to 15-10ths, and in that of the Edenbridge and District Company to 12-10ths. In connection with various Bills—Brentford and Ossett for example—there was contention over the provision of outer testing-places; but Committees see that with a calorific value standard, there is less need than formerly for out-district testing-stations. The high-pressure meter testing clauses of the City Corporation and London County Council have gone through with modification. The provisions are not to apply to existing high-pressure meters before 1920; but in the case of new meters, the provisions will come into operation next April. The Southend Gas Company are to redeem £30,000 of their capital. This is compulsory; but they also have the option of redeeming a further £30,000. In the Kidsgrove Gas Bill, there was a penalty clause referring to the use of discs in prepayment meters. This has been disallowed. On the other hand, the Margate Gas Company obtained the right to make a charge for the special readings of meters—readings

made upon the request of consumers at periods out of the normal round of the meter-readers. The London Association of Accountants had rebuffs almost throughout their campaign to obtain parliamentary equality with the Institute of Chartered Accountants and the Society of Incorporated Accountants. In several cases, however, there appears the modified model special purposes fund clause which confers on the Board of Trade the duty of appointing accountants, which is a provision both unnecessary and cumbersome. The gas industry is well content to leave things in this respect as they were.

In this and the article published last week are given the salient features of the session relating to the legislative work in which the gas industry is mainly concerned. Looking to the future, we are afraid that, in present circumstances, there will be some disposition to refrain from going to Parliament next session for new powers, although we do not see any reason whatever why the "Business as Usual" principle should not apply as much to Private Bill Legislation as to the ordinary industrial and commercial affairs of the nation. But it is pretty certain that, unless there is a great change, and peace is soon within sight—a condition for which there is little present hope—there will be hesitation to enter upon the necessary preliminaries in November for Private Bill promotions. We feel that this will be a mistake, as, though the Government are anxious that, in order to conserve money, work which is not absolutely essential shall not be put in hand, they are equally solicitous that money shall be spent upon works which will provide labour to obviate or ameliorate local distress. We are not suggesting that the members of the Parliamentary Bar and the experts at Westminster or elsewhere are in such parlous condition that a session's slackness will have any disastrous effect upon them. But local distress will grow during the war; and it will continue long after the conclusion of the titanic struggle, with the volume and intensity of it all the greater the smaller the steps taken to provide useful employment. Possessing the choice, it is wiser to pay money out in return for labour rendered, than to alleviate distress by the distribution of money for which no service has been performed. In many cases, there is, of course, no choice. But in the provision of labour, gas-works schemes will all count; and parliamentary sanction may just as well be obtained to new schemes (if those responsible can concentrate attention upon them) during the coming months, as to defer them indefinitely, so that, at the earliest convenient opportunity, they may be prosecuted.

Municipalities and the Price of Gas.

THE shattering of a military despotism which has taken years to culture and to bring to a state of maturity—a despotism which knows no law or obligation so long as it attains the paramount ascendancy which is its objective—is not going to be a light task, or one that will be speedily (though it is firmly believed it will be eventually) accomplished. The hand of European nations has been put to the task, and there is to be no turning back now, however long it may take to achieve the purpose. But there is the domestic side to the war. This is war on a scale without precedent, and war without its equal in the change of circumstances that it has brought in its train. The economic conditions of the world, of nations, of cities, of towns, of villages, and even of families have been upset by it; and trade has been ungrooved, and new conditions reign. We cannot yet tell what will precisely happen in these unparalleled circumstances; but this we do know that most industry which is material to the times has maintained and even increased the level of employment, while in non-necessary directions there has been a descent. Official statistics show that in several industries, employment is on an excellent scale; also that the long break in the London building trade through the strike was in one sense a blessing in disguise, seeing that it projected work into the time of war, instead of finding that time upon us with the huge buildings now under construction practically completed. However, in several of the (at any rate) temporary non-essential lines, unemployment is growing; and especially is this so in those classes of work in which are engaged the female and the younger contributors to the revenues of the homes of the poor. Notwithstanding, distress, taking the country through, is not yet so acute as no doubt it was expected that it would be by this time; and this condition is partly owing to the demands made upon the factories of this country both by home requirements and by those of other countries. But distress is present; it is perceptibly growing; and the coming winter cannot fail to be a hard one—in more than one respect. Upon our municipal and poor-law authorities there will rest a heavy responsibility the next few months.

Despite the national relief fund, it is inevitable that there will be a great strain upon the finances of the local authorities. About this there can be no two opinions. But the question of how best they are to prepare to meet the strain is a many-sided one. Expenditure must be along those lines that will give most value for money. Useless outlay must be avoided; but, as we have previously said, it will be better to spend money in providing work than to distribute money in relief (except where it is compulsory) without any return being secured in the nature of work. For a time, too, it may be necessary to set aside much of the old financial policy of municipalities in connection with their productive undertakings. There seem, however, to be municipalities who are desirous of carrying on their concerns as though times were normal; as though the war was having no effect, direct or indirect, upon the businesses of their concerns. They would like to see the same profits distributed in relief of rates—more particularly from gas undertakings—and the reserves still enlarged, unmindful of the fact that such undertakings provide interest and sinking funds in respect of loans, and are (when assessed in correct manner) large contributors to the local sum of rates and taxes. With a view to maintaining the gas revenues—in view of coal prices, the state of the residuals markets, and reduced demand for gas—some municipal gas authorities have been considering whether or not they shall increase the price of gas. Only those gas companies who are absolutely compelled to advance the price will do so; and we particularly hope that municipal authorities will refrain from such a course, inasmuch as among the poorer section of their constituents gas has become quite a distinguished need in their daily life. With very little modification, municipal authorities who are contemplating an increase in price will find a few words employed by Sir Corbet Woodall, at the British Gas Light Company's meeting last week, particularly apposite to their positions: "This, in the opinion of "your Directors, is not the season for accumulating larger "reserves, but rather for aiding, to the prudent limit, in "meeting the needs of the day."

In other cases, municipalities have been giving consideration to the question of possible ways of avoiding an increase in the price of gas, because it is recognized to be bad policy in a burdensome time to make, if avoidable, the burdens heavier by charging a higher price for a commodity which is now necessary in all quarters of a community. Exceptional conditions will demand exceptional treatment. There has been deliberation over the questions of making some inroads into reserves, and of suspending sinking-fund contributions during the war, in order to escape for the present from the necessity of raising the price of gas. As a means to this end, the suggestions referred to first reached us from Mr. A. Canning Williams, the Treasurer to the Edinburgh and Leith Gas Commissioners; but he subsequently found that a movement in the same direction had been made by the Institute of Municipal Treasurers and Accountants and by Mr. J. Beckett, the Borough Treasurer of Accrington. Nevertheless, an extract may be given from the letter Mr. Canning Williams sent to us:

> My own view is that municipal gas undertakings would be fully justified in making reasonable drafts upon their reserves (which have been built up in "the piping time of peace"), in order to avoid increasing the price of gas while the war lasts; and I cannot think that the Government would object to a temporary departure from strict statutory requirements in order to secure this end. Why should not a short Act be passed authorizing local authorities to suspend, or modify, if they think fit, their sinking and reserve fund contributions during the time of the war, and, if necessary, for a year or two thereafter? This would ease matters as regards rates and gas and other public services, and would not appreciably affect the financial stability of the country.

The trouble is, for immediate purposes, that Parliament may not be meeting again this side of the termination of the war, and so will not be in the position to pass a short Act, as suggested, to give the necessary authority to apply these alternatives to the raising of the price of gas, if trading conditions should necessitate. But we repeat that exceptional circumstances will require exceptional treatment; and why should not the Local Government Board give a temporary permissive power (until statutory authority could be secured

by a short General Act when Parliament meets again) to postpone legislative obligations relative to the redemption of loan debts and annuities? This would extend—say, for a year—the period of the repayment of loans and annuities sanctioned and borrowed; and no one would really feel a penny the worse off by such an arrangement.

The Institute of Municipal Treasurers and Accountants apply the proposal to wider ground, and suggest that the postponement of redemption for one year should apply to the whole range of municipal loans and annuities. This, too, was the line taken in the correspondence which Mr. Beckett has had with Mr. J. S. Higham, M.P., and Mr. Harold T. Baker, M.P., the Financial Secretary to the War Office. These gentlemen agree that the proposal is, so far as they can see, the least inconvenient method that can be devised for aiding local authorities in this abnormal time, when the financial stress upon them will be so largely increased; and they have communicated to the President of the Local Government Board both the case for suspension and their own concurring views. This is, of course, a matter that requires consideration from the standpoint of whether any better scheme can be devised. But this one comes before us with the ratification of several financial officers of municipal authorities who have investigated the position; and therefore the Board have excellent support. But Government Departments are ever slow-moving; and, though the case is so strong—though it is obvious that revenue from rates and other sources will be seriously curtailed the next few months, though work must be provided and financed to minimize the pressure of distress, though additional funds must be supplied to relieve those who cannot work, or for whom employment cannot be found—our latest information on the subject of the representations to the Local Government Board does not enlighten us as to whether or not the Board have shown even any interest in the matter. It is an important question; and its importance merited prompt attention in Whitehall.

Gas-Fire Position and Prospects this Season.

THE weather has been capricious lately; and there have been some cold intervals and a decided autumn touch about mornings and evenings. The gas-fire in the bedroom has been lighted; and generally the output curves of gas-works have shown incipient hillocks at the hours of rising and retiring. Householders are beginning to turn their attention to their heating arrangements for the winter. The chilliness and the conditions that prevail outside will induce people—those who can afford to do so—to think of comfort at home; and we are inclined to the view that the gas-fire will take good part in the provision. From several quarters comes the intelligence that though many undertakings have not, in view of the indecision created by the war, laid in their usual stocks of fires, the past week has seen a good demand for them from householders, and things now look promising. One reason (among others) perhaps why there was at first indecision about buying stocks to the customary extent was that a like indecision apparently got hold of some of the larger gas-fire firms; and, instead of trying early to stimulate interest in their new or forthcoming productions, they temporarily ceased—this does not apply to all of them—their normal advertising. That, however, is a lapse which is now being rectified; and as advertisements and descriptive articles (one or two of which have already been published) appear in our pages, it will be seen that any idea that may have arisen in the minds of our readers of languor and dormancy having overtaken the gas-fire makers has been an egregious mistake, and that they have within their works been busy improving and preparing for a gas-fire season in which higher standards than ever will be demanded by (as the case may be) buyers and users.

The hygienic and heating efficiencies of most makers' fires are now something that have proved realities, and are not mere statements founded on assumption which has not been put to the proof of thoroughly scientific test. The next desideratum is the silent gas-fire; and work to secure this—work which started prior to last year's heating season—has been continued. The success that has been achieved by certain of the firms is highly satisfactory, and that without detrimental effect on heating efficiency. This is all to the good in realizing perfection in domestic heating by gas. The coming season's gas-fire business, it seems likely, will be specially among the better-class houses; and, if this be so, the best types of fires should be in good demand. In such houses, the capacity for spending will, generally speaking, naturally be greater than in houses occupied by the part of the community that has been put on reduced salaries and wages, and in homes the contributors to the income of which have been lessened—through joining the Colours, or through absence of employment. But in this connection, the circumstances of districts vary considerably, and gas undertakings will have to proceed accordingly. In the local advertising of gas-fires, it will be as well not only to call attention to their efficiency merits, but to especially emphasize at this particular time the two facts of labour-saving, and of no demand for payment for gas until the end of the quarter. The retail coal dealers still find a disinclination on the part of householders to stock to normal extent. Coal yards are pretty full; and pit-head stocks are large. Yet in certain coal fields—Staffordshire, Warwickshire, Derbyshire, and Leicestershire—there is talk of an increase of coal prices on account of the cost of timber! Some gas-works, on the other hand, are finding an improved demand for coke. Experiences will vary; but there is ground for belief that the gas business (distinct from the residuals trading), taking the country through, will not be bad this coming winter.

The Standard of Quality.

THERE is the making in our columns this week of a very pretty triangular controversy between Mr. Norton H. Humphrys, Mr. Walter Grafton, and Mr. J. H. Fairweather—if Mr. Grafton can be drawn. We have tried to draw him, but have failed. Perhaps Mr. Humphrys and Mr. Fairweather will be more successful. Two articles appear in other columns by the two last-named gentlemen; and they both criticize the paper presented by Mr. Grafton to the North British Gas Managers' Association [see "JOURNAL" Sept. 8, p. 573]. Mr. Humphrys has a shot also at the article by Mr. Fairweather [*ibid.*, p. 562]; and Mr. Fairweather, at part of the editorial comments on his first article. The claims made by Mr. Grafton in connection with argand burners, and the loss he fancies the gas industry has incurred through (also his idea) the calorific standard having been based upon gas tested by the "Metropolitan" No. 2 burner, and not by his "Ideal" burner, receives a further trouncing from both our contributors. As Mr. Fairweather points out, there never was, in determining the standard of calorific value, any averaging of the B.Th.U. per candle; but the figure was derived from regular testing over several years of the calorific power of the gas supplied by the three Metropolitan Gas Companies. This being so, the use of an argand burner or other than the No. 2 would not have made any substantial difference in the result. But there is no profit in now arguing over this matter, although, if Mr. Grafton has anything to say in defence of his views, and in criticism of the two articles that appear this week, we shall be happy to publish a communication from him.

The more interesting matter is the one originally raised by Mr. Fairweather as to the value to the gas consumer of the calorific standard, and his suggestion as to further research into all the points affecting it. But his present article does not, in our opinion, advance the question beyond where he left it in his former communication. He is trying to grasp something that has yet no actuality. He wants a standard of quality that will be a real one in showing the consumer just what he is getting in intrinsic value for his money. Calorific power, he says in effect, is not a real standard, and so *per se* is almost worthless. As before intimated, we cannot go the whole way with this opinion; but what is said as to calorific power not being a positive measure of value is, of course, correct. It is, however, the best and simplest thing we have at present for adoption as a statutory qualitative standard; and our contributor has not anything better to offer. His previous article, he tells us, was not intended to be an argument for the retention of the illuminating power standard, and (to remove from our minds the suspicion we had entertained) he adds that neither was his contribution a plea for a prescribed constitution of gas. So we are again left high and dry on the rocks, and must perforce be content with calorific value as the statutory standard until (if ever) something better and simpler can be suggested, and is acceptable to Parliament. Where to look for a superior alternative is the difficulty. Mr. Fairweather suggests a thorough investigation. We trust that all, our contributor included, who have the opportunity to investigate the question, in the light of the argument advanced in Mr. Fairweather's article on Sept. 8, will do so, and let us

have the results, though we are not very hopeful as to any successful discovery. However, like Mr. Humphrys, we do not wish to discourage such an investigation. Professor Cobb might make note of the subject as an appropriate one for research, when suitable opportunity offers, at the Leeds University.

To do Mr. Fairweather justice, it should be made clear that he does not by any means desire to give greater protection to the consumer by stiffening the standard as against the gas industry. His whole argument in dealing with the question of the presence of a larger proportion of hydrogen in the gas supplied, and keeping the inert gas down to the narrowest limits, was directed to showing the possibility of a lower calorific value gas being in service a more useful one for the consumer. Now he goes farther, and shows us the germ of another idea that is in his mind. He says: "I have seriously wondered whether ultimately any quality "standard, other than a limitation of incombustibles, will "be found necessary, when adequate pressure is assured." Only those would object to such a standard (if the limitation of inert constituents were put at a reasonable level) who pride themselves on large makes per ton, irrespective of the percentage that is valueless and even detrimental to the consumers. But "adequate pressure" requires definition. Certainly it could not be up to the 10 inches suggested in the previous article by the same contributor, in view of the practical limitations set, as Mr. Humphrys reminds in his article, by consumers' meters and fittings.

Regarding Mr. Humphrys' criticism of the points made by Mr. Fairweather with a view of showing that a gas of lower grade through a larger hydrogen content—lower grade as adjudged by the calorimeter—would be of greater value to the consumer than a gas of higher calorific power, or a gas of higher calorific power and yet containing a larger percentage of incombustibles, we do not think that Mr. Arthur Forshaw's Institution paper in 1909 has any conclusive bearing. Mr. Forshaw did not put forward the results of his interrupted research as showing any finality; and moreover it dealt with the gases hydrogen and carbon monoxide, and not with a complex gas such as coal gas. The two gases have nearly the same calorific powers; but the rate of combustion of hydrogen is very much higher than that of carbon monoxide. The point is what is the influence of the hydrogen in the complex mixture distributed to the consumers, and not what is its effect when consumed alone in an incandescent burner. Mr. Fairweather submits that as a constituent of coal gas, its effect is such that a larger percentage, though the calorimetric value of the gas would be lowered, would not be detrimental to the consumer, but would be an advantage in relation to flame intensity—its rate of combustion being high, and its flame volume less than that of other gases. The point is one that is worthy the fullest inquiry in these days when there is talk of reducing the average cost of production by increasing the make per ton of coal. There is injury to the consumer in doing this by largely increasing the percentage of inert constituents, which run off with an undue percentage of heat in the products of combustion. An increased quantity of hydrogen would be preferable; and an indication of the advantages to the consumer are given in Mr. Fairweather's first article, but are not fully discussed by Mr. Humphrys.

Another Report from Australia.

The report which appeared in the last issue of the "JOURNAL" regarding gas matters in Sydney, is followed in the present number by a similar statement from another large Australian gas undertaking. The position of affairs revealed at the half-yearly meeting of the Metropolitan Gas Company of Melbourne was of an eminently satisfactory character; the outstanding feature being an increase of over 9 per cent. in the output of gas, compared with the first half of last year. The lines of development of these large Colonial concerns are precisely similar to those of our enterprising gas undertakings at Home. In Melbourne, one notices a rapid increase in the placing of apparatus for the utilization of gas for domestic purposes other than lighting; while progress in the last-named department is being aided by the provision of high-pressure lamps, for both street and shop illumination. As to the manufacturing department, the two large installations of vertical retorts at present working are now being supplemented by a third. This time a different system, too, has been adopted, so as to provide comparisons of results which will act as a guide in the matter of future extensions. In yet one other respect is the experience in Australia much the same as that of gas undertakings on this side—that is, in regard to residual products. A falling-off during the coming half year is foreshadowed, though events subsequent to the meeting may have modified to some extent the views then expressed. The severe set-back which has taken place in the price of sulphate of ammonia was stated to be due to a largely increased production of this commodity in Germany. Obstacles to export have, however, since been put in Germany's way; and there are so far no signs of their early removal.

Gas-Works and Employment Schemes.

At other times and in other places we have called attention to the contributory part that gas-works can take in providing employment during the war by carrying out works of a permanent character. In a letter on the subject in our "Correspondence" columns to-day, Mr. W. R. Herring points out that there are many gas-works that are still dependent upon plant which gives from the material employed a result 15 to 20 per cent. less than would be obtained were more modern plant adopted. Thus the disestablishment and supersession of the old plant would be an economy, and give to those concerned a fair return on the expenditure involved. The present is a good time for carefully considering plant changes and maturing schemes. Unfortunately, however, the war is now running into the season when gas-works cannot enter upon a complete overhauling of the plant. But it is not likely that the war and its uneconomic effects will have been cleared away by the early spring; so that, at any rate, plans could be well arranged now for execution directly the time is again favourable. The financial element in the carrying-out of new or reconstruction schemes is the important one. For permanent works, however, to help to maintain as high as possible the level of employment, the Government are prepared to let municipal authorities have money on the same terms as those upon which the war loans are being raised. With gas companies the case is different. The present time is not the best for the issue of new capital, although some companies are asking the public to subscribe for new issues. But in those instances, it must be due to pressure in view of the terms exacted for loans from bankers. The invested funds of the companies cannot be realized to-day, except at great sacrifice; so that these funds are not available for temporary utilization. It therefore seems to us that gas companies are worse off than gas-owning municipalities in adopting the suggestion of Mr. Herring, of gas-works helping to contribute to employment by producing working economy for themselves. After the war, a boom in industry and trade; and for that boom, gas undertakings should be properly prepared.

Reinforced Concrete Road Foundations.

A case of considerable current interest is referred to in our "Legal Intelligence" to-day. The Gas Light and Coke Company are the plaintiffs, and two District Councils are the defendants. Road work for pipe and cable owners has become a very expensive affair since stronger roads, paved roads, and concrete foundationed roads have become the vogue. But here are two Councils who are, it appears, employing reinforced concrete for the foundations of certain roads, and are intending to use it for other roads. Concrete is difficult and costly enough to break through and to replace under ordinary circumstances; but reinforced concrete! The views of road surveyors expand as to what is necessary for surface support and modern traffic. The eminent gas engineer who once told us that it made his heart bleed to see the men breaking through ordinary concrete foundation work in the roads of London would doubtless suffer severely if he saw gas main layers at work on reinforced concrete. The Gas Light and Coke Company, though not desirous of being unreasonable in any way, think that the time has arrived when they must through the Law Courts seek to protect their statutory rights in regard to the user of the subsoil of roads. The District Councils contend that they have the right to build-up the roads as they think fit—no matter, apparently, whether or not other people are prejudiced thereby. It is noticeable that the District Councils do not appear to care for the settlement of the case on a test to decide whether the reinforced concrete is harder than the concrete ordinarily employed for road foundations. This was proposed by the Gas Company, but was not jumped at by the District Councils. If the reinforcement is used in roads where there is electricity escaping, and where the concrete gets damp, it may be found that the reinforcement is a disadvantage rather than otherwise.

First Agreement, then a Kick.

It will be remembered that Mr. Edward Allen, in his evidence before the Smoke Abatement Committee, advocated that public bodies should forego profits in aid of the rates, and supply gas at as low a price as possible to encourage its use for heating, and so relieve the atmosphere of coal smoke. The "Financial Circular" of the Institute of Municipal Treasurers and Accountants for September contains some comments upon this matter, which, in the first place, show a general concurrence with Mr. Allen, and then follow on with a kick—and an undeserved one—at the Liverpool Gas Company. The writer points out that Mr. Allen did not say that the shareholders of gas companies should submit to lower dividends, in order to reduce the price of gas, and so encourage its use in lieu of coal. Then credit is taken to municipal financial officers for having for many years argued in favour of the supply of commodities at a price as near the true cost as is possible; but the "contention has been from the point of equity as between ratepayer and consumer." It is a pleasure to see that the financial officers have maintained that the gas consumers in a district should not pay a higher price for gas than is necessary to provide for all expenses incurred in the production, simply in order that rates may be reduced, not only to the benefit of those who consume gas, but also of those who may use only electricity. But they see a difficulty in the fixing of the price. It is that, "if we do not allow a reasonable margin for contingencies in the way of increases in the price of materials required in the production of gas, and decrease in the demand for the residuals, we shall perhaps find that, instead of just 'paying our way,' we are left with a deficit, and the consequent rate in aid." Passing on, it is remarked that it is "interesting to note, as showing how far the Liverpool Gas Company is 'public-spirited,' that upon a quarter of its capital the Company pays the maximum dividend of 10 per cent., while upon more than a third of the capital a dividend of 7 per cent. is paid, although the price charged to ordinary consumers is 2s. 1d. per 1000 cubic feet—a rate certainly not less than the average charge made in the areas of large gas-supplying municipalities."

Some Ignored Facts.

This is all very interesting. But as to the difficulty that the financial officers find in fixing prices for gas, we rather fancy these gentlemen do not as a matter of fact have much to do with the settling of such prices. Recommendations come from other quarters, in which the difficulty of fixing prices is not experienced in normal times to the same degree. Gas-works materials being generally contracted for, the price is known in advance, or a very fair forecast can be made as to the probable movements of the markets for them. The residuals markets are more inconstant and uncertain; but retrospect helps in this direction. There is really no occasion at all to argue over the matter, as there is the example of Scotch gas undertakings which are not allowed to distribute profits in aid of the rates, and their managements do not have any great difficulty in making price adjustments one year with another, and so keep themselves within the terms of their statutory obligations, and without inflicting a rate in aid. Everybody seems quite happy under the arrangement, except that prices might in some cases be lower if an unnecessarily high quality of gas were not supplied—a quality that is a positive disadvantage to the consumers. As to the kick at the Liverpool Gas Company, it ought to be within the knowledge of the Editor of the "Financial Circular" that the price of the Company's "A" (10 per cent.) stock was before the war 211-13, that of the "B" or 7 per cent. stock 146-48, and that the returns on the investments were not 10 and 7 per cent., but respectively £4 13s. 11d. and £4 14s. 7d. This is a different story from the one he tells. As to the price of 2s. 1d., the quality of gas supplied in Liverpool has been higher than in Birmingham (average price 1s. 8d.), Bolton (ordinary price 2s. 4d.), Bradford (2s. 1d.), Carlisle (2s. 3d.), Leeds (2s. 2d.), Leicester (2s. 4d.), Manchester (2s. 3d.), Nottingham (2s. 2d. and 2s. 4d.). In some of these cases, higher rates are also charged in the out-districts. The figures quoted here are taken from the last issue of "Field's Analysis."

The late Alderman J. P. Ford (at the time of his death Vice-Chairman of the Nottingham Corporation Gas Committee) left property of the gross value of £26,467; the net personalty being sworn at £19,416.

DEATH OF MR. T. J. BUSH.

We much regret to record the death last Wednesday, in his sixty-eighth year, of Mr. Thomas James Bush, Engineer of the Australian Gaslight Company, of Sydney (N.S.W.), and brother of Mr. Frank Bush, formerly the Secretary, now Deputy-Chairman, of the South Metropolitan Gas Company. Deceased came to London some few weeks ago to have further advice in regard to his health, and died in a nursing home as the result of a serious operation.

Mr. Bush was for several years the Assistant-Engineer at the Beckton station of the Gas Light and Coke Company; but in 1878 he was appointed Engineer of the Australian Gaslight Company, on the recommendation of their Consulting Engineer in London, the late Mr. William Mann. He took entire charge of the works, in which he effected considerable improvements; and under his direction the Company's operations were in a few years almost quadrupled. Among his engineering achievements were the design of the extensive station at Mortlake, and the supervision of the erection of a large gasholder constructed by Messrs. C. & W. Walker, which was fully described and illustrated in the "Journal" at the time. In 1890 the Company acquired the undertaking of the Parramatta Gas Company; and the same year they suffered from a labour strike which entailed upon them a loss of nearly £33,000.

Early in 1891, Mr. Bush visited England on a six months' leave of absence. He paid a second visit in 1899, in order to inspect the latest improvements in the gas-works here and elsewhere. Before he left Sydney, the officers and staff of the Company showed in a practical way their appreciation of him by presenting him with a dressing-case having solid silver fittings, each bearing his monogram. The presentation was made by the Secretary (Mr. R. J. Lukey), who assured Mr. Bush that he was very popular with all the officers and staff, who wished him a pleasant journey, an enjoyable time at home, and a safe return. They expressed the hope that he might be long spared to continue his connection with the Company.

About five years ago, Mr. Bush's health began to cause him some anxiety; and in the spring of 1909 he left Sydney on a third visit to London, in the hope that the rest and change would prove beneficial. His intention was, if his health permitted, to avail himself of the opportunity of seeing the many improvements which had been made in connection with the gas industry in England and on the Continent since his visit in 1899. Unfortunately, after eighteen months' relief, he was unable to resume his duties. On his return to Sydney he underwent a serious operation, from which he recovered only very slowly. In his absence, the works were under the control of Mr. Andrew Wilson, who a few years ago went to Sydney to fill the position of Assistant-Engineer. He prepared the plans for a holder of 12 million cubic feet capacity, for the Company's works at Mortlake, which early last year their London Agents (Messrs. William Coward and Co.) received instructions to put in hand. The works have since been furnished with vertical retorts on the Glover-West principle; and the whole of the operations are carried on there.

Mr. Bush joined the British Association of Gas Managers in 1874, passed into the Gas Institute, and subsequently into the present Institution. He was a member of the Institution of Civil Engineers, having been admitted in 1898.

PERSONAL.

In view of the appointment of Mr. John Richmond to take charge of the Tipperary Gas-Works, the Directors of the Penicuik Gas Company interviewed four out of a number of applicants for the managership, and Mr. Peter M'Dougall was selected. He is a son of the late Manager of the Port-Glasgow Gas-Works, served his apprenticeship with Messrs. R. Laidlaw and Sons, was foreman at the Falkirk old works, and also at Helensburgh and Stockport, and was temporarily Manager at Leatherhead.

On the 25th of June the Stoke-on-Trent Federated Council passed a resolution deferring the appointment of a Chief Gas Engineer until a report had been presented by the Gas Committee on the necessity of combining the four gas undertakings in the borough. At the meeting of the Council last Thursday, this resolution was rescinded, and a recommendation of the Committee confirmed appointing Mr. William Langford, the Engineer at the Longton works, Chief Engineer and Manager of the Corporation gas undertakings, at a salary of £600 a year, rising by annual increments of £50 to £700.

Mr. Thomas Carmichael, who is leaving Glasgow to take up the position of Works Superintendent at the Eastcroft Gas-Works, Nottingham, has been presented by the staff and friends at Dawsholm and other works of the Glasgow Corporation Gas Department, with a handsome marble timepiece, suitable side ornaments, and technical books. Mr. Harrison, the Chief Assistant-Engineer, when making the presentation, spoke highly of Mr. Carmichael's work in the department, and on behalf of the company expressed congratulations on his success in obtaining the appointment, and best wishes for his future career. Mr. Carmichael suitably replied.

THE GAS INDUSTRY AND THE WAR.

At the last annual meeting of the Society of British Gas Industries, the retiring President (Professor Harold B. Dixon), when introducing his successor, Sir Alfred Keogh, K.C.B., referred to him as one who had "proved his capacity on many a stricken field." Sir Alfred is the British Red Cross Society's Chief Commissioner in France, and is stationed at Rouen, where he is doing excellent work.

From the head office and the London and Arbroath works of the James Keith and Blackman Company, Limited, over a hundred men have either been called up as Reservists or Territorials, or have joined the Colours since the war was declared. A large number of these men (particularly among the Reservists and old Territorials) leave dependants behind; and, as in the Boer War, the staff and employees of the Company started a fund among themselves. By Aug. 14, they were rendering such assistance as was necessary to the families of those employees who were with the army. The fund is raised by the whole of the employees remaining paying a levy on their wages and salaries at a percentage to meet the outgoings; the Company themselves giving a sum equal to 50 per eent. of the amount raised among the employees. The fund is administered by a representative Committee; and the distribution of the money is arranged as nearly as possible to meet each individual case. The recipient of any money from the fund must first declare all sources of income, and then the average of the pre-war receipts of the household is made good from the fund, less about 20 per cent., which represents the man's keep and pocket money.

We learn from Messrs. Tilley Bros., that Lance-Sergt. Geoffrey Tilley, son of Mr. F. C. Tilley, is now embodied and is on active service with his unit, the Rangers 12th London Regiment, and Mr. Oswald Tilley (another son) is serving with the London Rifle Brigade. Also that Lieut.-Colonel W. Carmichael Peebles, T.D., Managing-Director of Messrs. Peebles and Co., Limited, has, since mobilization of the Territorial Force, been commanding his regiment of the 7th Battalion, the Royal Scots on Home Defence. Colonel Peebles had the honour of submitting to the Military Authorities 100 per cent. of his officers and over 80 per cent. of his men for foreign service; and the offer was accepted. A reserve battalion is now being raised to allow the present unit to leave at the earliest opportunity. It may be interesting to note that two brothers of Colonel Peebles are also giving their services—Captain J. R. Peebles, who is serving under him in the 7th Battalion of the Royal Scots, and Captain A. C. Peebles, R.E., commanding the Electric Light Company of the City of Edinburgh Fortress, R.E.

In last week's issue the statement was made that the Preston Gas Company had contributed £100 to the War Fund. This was an error, as the figure should have been £200. In addition, the staff and employees of the Company have voluntarily decided to make a weekly contribution from their wages towards the fund.

One of the slot collectors of the Lea Bridge District Gas Company, a sergeant in the Seventh Middlesex Regiment (Territorials), writes home that his regiment reached Gibraltar at 1 a.m. on Thursday, Sept. 10. He states: "My company was sent out to the Europa Point (that is the most southerly point in 'Gib.'), and I had to take the first guard; so I had the honour of mounting the first Territorial guard abroad, as 'ours' was the first battalion to start foreign duty."

It was stated in last week's issue that the Directors of the Newcastle and Gateshead Gas Company are paying to all their employees who have joined the Colours full wages and salary, less the amount received by way of pay and separation allowances from the Government. The amounts thus being paid by the Company reach over £100 per week.

The Simon-Carvès Bye-Product Coke-Oven Construction and Working Company, Limited, of Manchester, have issued a notice in the following terms: "Owing to the fact that many of the principal coke-oven construction companies in this country are largely owned by German shareholders or partners, and in view of the inquiries which have been made to us, we think it necessary to state that our own Company is, and always has been, an entirely Anglo-French concern. The Directors and shareholders are all British or French subjects."

The Mayor of Chester (Alderman J. M. Frost), who is also Chairman of the Chester United Gas Company, has received a telegram from the War Office announcing that his son, Lieutenant T. L. Frost, of the Cheshire Regiment, previously reported missing, had on Sept. 18 rejoined for duty.

Fifteen men in the employ of the Torquay Gas Company have joined one or other branch of the National Service. In the case of married men, it has been arranged to make up the full difference between the Army allowance and their average weekly wage, and to keep their posts open until their return. Arrangements for keeping places open have also been made in regard to the single men, with provision for their dependants. The Directors have voted in money to the Prince of Wales National Fund and the Red Cross Fund, and in fitting up local Red Cross hospitals, a sum equal to £50.

Last pay day (Sept. 15), a money-box was placed in a conspicuous position in each of the Treasurer's Departments of the Edinburgh and Leith Corporations' Gas Commissioners; and it was intimated to the clerks and collectors that, if they felt disposed to contribute to the National Relief Fund, these boxes gave them an opportunity of doing so. A good response was made to the boxes' silent appeal. It is intended to repeat the process each month during the war. It is claimed for this plan that it gives each member of the staff perfect liberty to contribute or not as he may think fit, and also to vary his contribution from time to time in accordance with his own special circumstances.

The Chorley Gas Department have resolved that all employees who, as members of the Forces, have been affected by the mobilization or embodiment consequent on the war, should be allowed half-wages until the war is over.

The staff of the Doncaster Corporation Gas Department have agreed to make weekly contributions to the local Belgian Relief Fund, the amount varying according to the earnings of the contributor. The minimum is approximately 2d. in the pound.

At a meeting of the Hebden Bridge and Mytholmroyd Gas Board last Thursday, it was reported that the employees were giving contributions to the local war distress fund, in proportion to wages earned, of from 2d. to 3s. 3d. per week.

The employees of the Smethwick gas undertaking are contributing weekly to the Prince of Wales's War Fund.

The Halifax Gas Committee have decided to give 10,000 bags of coke for distribution by the Halifax Guild of Help. The Gas Committee of the Ossett Town Council have arranged to give 150 tons of coke to the administrators of the local distress fund, for distribution among needy people resident in the gas area.

An order has been issued by Col. J. Aspinall Turner, the officer commanding the troops at Barrow and district, putting certain restrictions on lights in exposed places within a 50-mile radius of Barrow. The effect of the order on Blackpool's autumn illuminations was subsequently pointed out to the Colonel by a deputation from Blackpool. They were informed that the order will not affect Blackpool; Col. Turner stating that he had no objection to the illuminations, nor had he any objection to the lights at the summit of the tower, providing they were extinguished by 11 p.m. He made no restrictions whatever regarding the illuminations and the lighting of the promenade and streets.

During the proceedings at the second ordinary general meeting of the Chiltern Hills Spring Water Company, the Chairman (Mr. J. M. James) said the Directors had had before them the question of making a subscription—and in the circumstances a generous one—to the Bucks County Relief Fund, which had been raised for the purpose of meeting distress arising from the war. Looking at the position of the Company, and the wide area they served with water, in various parishes besides Aylesbury, the Board decided to recommend a contribution of £100 to the fund. This recommendation was agreed to by the shareholders, on the proposition of Mr. George Lane, who said the amount was a generous one, and he was glad the Directors had so loyally responded to their country's call.

At a meeting of the Swansea Water Committee last week, a letter was received from the Home Office stating that they did not consider the duty of patrolling the Cray Reservoir a military matter; and the Chief Constable of Brecon wrote saying that unless the Corporation undertook to pay for the men guarding the reservoirs, he would have to withdraw the patrol. A temporary arrangement was come to, pending the making of arrangements for the period of the war.

Messrs. W. Canning and Co., of Birmingham, have lost 48 of their staff, foremen, and workpeople, who have joined the forces. The firm have issued a circular in which they point out that articles manufactured only in Germany or Austria cannot be replaced until the war is over; while others are at present just as difficult to obtain from France, Russia, Spain, or Italy. It is, however, the firm's opinion that the present state of things will gradually become normal, whether peace arrives soon or late. Their view is that the high prices ruling will fetch supplies at all risks from other countries to the British market.

We have received from Messrs. E. & S. Livingstone, of Edinburgh, a copy of a book entitled "Gas Poisoning in Mining and Other Industries," by John Glaister, M.D.(Glas.), D.P.H.(Camb.), F.R.S.E., and David Dale Logan, M.D.(Glas.), D.P.H. In the preface to the work, the authors state that "an attempt has been made to focus within reasonable limits our knowledge of the subject of poisoning by carbon monoxide and other gases arising chiefly in mining and other industrial pursuits." The price of the book is 10s. 6d. net; and a review of its contents will appear in a subsequent issue of the "JOURNAL."

GAS ACTS FOR 1914.

[First Article.]

Very few of the Bills in which gas supply formed the sole or part subject-matter failed to pass through Parliament this last session, though several of them had some of their features mutilated or modified either for better or for worse. In reviewing the Acts, there is no occasion to repeat all the details that were given when noticing the Bills in January last; and so these articles will be directed to showing what have been the principal alterations made during the travel of the measures through Parliament. The Acts that will be first noticed are those that have raised to full statutory status a number of existing gas companies, or have conferred powers on newly-formed ones.

Henceforward, the Chelmsford Gas Light and Coke Company will be known by the shortened title of the Chelmsford Gas Company. By the general purposes clause, they are to be entitled to "purchase, convert, manufacture, and sell" all residual products. There is a slight change in the capital powers. It was originally proposed that the capital should be £123,850, represented by capital stock to the amount of £69,850 in respect of the ordinary capital of the old Company, and £54,000 of additional capital. The first two figures have been altered to £126,650 and £72,650. Inclusive of £10,500 already raised, the Company are empowered to borrow in respect of the old capital £24,200 (in the Bill £23,280 was mentioned), and one-third in respect of the additional capital. It is noticed that the general purposes fund clause provides for the appointment of an accountant by the Board of Trade, instead of following the more sensible displaced model clause, which provided for "a chartered accountant or incorporated accountant (being the auditor of the Company), or appointed for the purpose by the Board of Trade." The change in the model was made at the request of the London Association of Accountants, who do not enjoy in the financial world the same distinction as the Institute of Chartered Accountants and the Society of Incorporated Accountants. In connection with the extension of the limits of supply, if the powers are not exercised by the expiration of ten years from the passing of the Act, then the Act is not to be deemed an obstacle to any other company, person, or authority obtaining statutory powers of supply; as a matter of fact, the Company are debarred from opposing, otherwise than upon details, any application by the Council of any of the districts for the purpose of providing a supply, and for the repeal of the powers of the Company. A clause for the protection of the Chelmsford Corporation contains a provision that pipes that are laid or relaid are to have a depth of not less than 2 feet intervening between the road surface and the top of the pipe; but this is not to apply to pipes laid under footpaths. The Essex County Council are not to be liable to damages for pipes laid at a less depth that may be injured by a steam or other roller not exceeding 12 tons in weight. The Great Eastern Railway Company have also secured protecting powers. The dividend on the ordinary stock is to be 5 per cent. The standard price proposed in Chelmsford, Springfield, Bloomfield, and Great Baddow (the inner area) is to be 3s. 9d., instead of (as formerly proposed) 3s. 11d. In the outer area, the Company are empowered to charge any price not exceeding 9d. more than the price for the time being charged in the inner area. The other clauses noticed when the Bill was introduced are retained. Finally, there is the purchase clause in favour of the Corporation of Chelmsford, which gives them power to promote a Bill next session without opposition from the Company, excepting so far as this may be necessary for the protection of their interests. In addition to the amount to be paid for the undertaking, the Corporation are to pay to the Company the costs of obtaining this Act, the costs of watching or procuring any amendment of the Corporation Bill, and £200 in respect of the transfer and winding-up of the Company. Provision is also made for compensation to Directors, officers, and other servants (except weekly servants of less than ten years' service) who are not continued in the employ of the Corporation, as well as for the payment of dividend until the date of transfer. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

Turning to the Edenbridge and District Gas Act, it is seen that the general purposes clause has been modified somewhat. Instead of adopting the model clause proposed for the session, in violation of the Joint Committee's recommendation in regard to residuals dealings, the Company proposed the old wide-spreading form, which authorized them to "purchase, provide, produce, sell, dispose of, and deal in gas, coke, tar, and all other residual products resulting from the manufacture of gas." This is now altered to "may purchase for purposes of manufacture, and may convert, manufacture, and sell all residual products resulting from the manufacture of gas." This is all that is wanted. The proposed capital has been reduced from £18,000 to £15,000; making the additional capital £7000 instead of £10,000. Regarding this £7000, it is provided that if the Company, at the expiration of three years, have not laid mains along certain specified routes, then the additional capital is to be reduced by £660 for each mile of 6-inch main, and £440 for each mile of 4-inch main which have not then been laid. The alteration as to the appointment of an accountant by the Board of Trade appears in the general purposes clause [see notice of the Chelmsford Act]. The local railway companies have obtained some protective clauses. The Kent County Council have secured clauses, among which is the provision that pipes in main roads are to be laid at a depth not exceeding 2 ft. 6 in. In regard to the extension of the limits of supply, if the Company are not after the expiration of three years furnishing a supply, or a reasonably sufficient supply, of gas to the parishes mentioned, they will find themselves helpless to resist other persons or authorities obtaining powers of supply. The Gas Light calorific clause has been applied. The standard is 540 B.Th.U. The calorimeter is to be used so as to give the total heat value of the gas; if the result of the test on any one day is more than 5 per cent. below standard, a second test is to be made, and the average of the two taken. The penalty line is 7½ per cent. below the standard; and the penalties have been stiffened in comparison with the proposals in the lodged Bill. If the deficiency does not exceed 14 B.Th.U., the penalty is to be £2; if it exceeds 14 B.Th.U., but does not exceed 28 B.Th.U., the penalty is to be a sum not exceeding £5; and for each complete 28 B.Th.U. of defective power, a sum not exceeding £10. The minimum pressure of gas has been raised from the 8-10ths of the model clause to 12-10ths. Other clauses are as in our notice of the Bill last January, or otherwise are of the stereotyped form. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The Hightown Gas and Electricity Act comprises a scheme for the supply of gas and electricity to Little Crosby in the County Palatine of Lancaster, and for the purchase of the petrol air-gas scheme of the Hightown Land Development Company, Limited. The promoters concerned in it are Messrs. H. L. Marsh, Isaac Carr, W. M. Carr, Ellis E. Linaker, and Robert Carr. As to the general purposes clause, it is seen that the Company are content to be empowered to "recover and sell all residual products resulting from the manufacture of gas, and may convert ammoniacal liquor into sulphate of ammonia." The capital and borrowing powers (including the special provision noted on Jan. 6) are the same as in the Bill. The maximum price of 5s. per 1000 cubic feet of gas has been reduced to 4s. The Company proposed an illuminating power standard, but changed it to comply with the Liverpool calorific value standard of 550 B.Th.U. (total heat value), with the penalty line 5 per cent. below this. The penalty clauses are somewhat different from the ordinary—viz.: If the calorific power of the gas is more than 5 per cent., but not more than 7½ per cent., below the standard calorific power, £2. If the calorific power of the gas is more than 7½ per cent., but not more than 10 per cent. below the standard calorific power, a sum not exceeding £5. If the calorific power of the gas is more than 10 per cent. below the standard calorific power, a sum not exceeding £10 for every 10 per cent. by which it is below the standard. The Company have obtained power to purchase and sell gas in bulk. Clauses follow relating to the purchase of the petrol air-gas works. Then there appears this clause:

> This Act shall not, by reason only of the enactment of the provisions thereof, confer any exemption from any general legislation relating to the supply of gas which may be passed in this or any future session of Parliament; but the provisions of this section shall not be construed as preventing the conferring of any such exemption, or the enactment of any such general legislation of any special provisions relating to the undertaking of the Company.

Electricity clauses follow. The Little Crosby District Council have obtained the insertion of a purchase clause, operative at any time upon giving six months' notice in writing to expire on Sept. 30 in any year. Protection is given to the Liverpool Corporation and the Lancashire and Yorkshire Railway Company. [*Parliamentary Agents: Messrs. Butterworth and Co.*]

The Bill of the Lurgan Gaslight and Chemical Company was withdrawn.

The Skegness Gas Bill was one that was furiously opposed by the local authority, and caused an undue expense to fall upon the concern. The Company, however, have obtained their Act. In the general purposes clause, they are empowered to "purchase, manufacture, convert, supply, and sell all residual products resulting from the manufacture of gas." All the capital and dividend powers remain intact as when the Bill was noticed [see "Journal" for Jan. 6]. The Company have obtained power to purchase compulsorily or by agreement the gas-works lands. Various authorities have secured protective clauses. The standard price of gas has been reduced from 3s. 9d. to 3s. 6d. The Gas Light calorific clauses are included, with the penalty clauses as in the Edenbridge Act. The minimum pressure of gas has been raised to 15-10ths. All else remains as in our original notice of the Bill, save that a purchase clause, operative next session, appears in favour of the District Council. [*Parliamentary Agents: Messrs. Tahourdin and Birds.*]

The South Bank and Normanby Gas Act is modest in size, but important to the Company. It achieves what the latter set out to do—extends their limits of supply, and finally revokes the unexercised powers of gas supply of the Middlesbrough Corporation within territory served by the Company, or intended to be served under the present powers. A few ordinary clauses, together with provisions protecting the North Riding County Council and the North-Eastern Railway Company, complete the compact little measure. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The Stone Gas and Electricity Act gives the Company extended area within which to operate, enlarges their lands for manufacturing purposes, bestows on them powers of electricity

supply, and increases their capital. There is not a single variation from the particulars given when noticing the Bill on Jan. 6 last, p. 24. Incidentally, it is observed that the special purposes fund clause places in the hands of the Board of Trade the appointment of an accountant. A purchase clause (operative in the session of 1916) has been inserted in favour of the District Council. If the purchase is effected, conditions have been agreed under which the Council will pay to the Company the costs of obtaining this Act, of procuring any amendments of the Bill to be introduced by the Council, and incident to the transfer of the undertaking and the winding-up of the Company. The Council are also to pay £1000 as compensation to the Directors. If the Council do not retain the services of Mr. T. W. Saville, the Company's Manager and Secretary, on the present terms, or if his services are dispensed with within five years, the Council are to pay him £1500 as compensation for loss of office. [*Parliamentary Agents: Messrs. Lees and Co.*]

If one wants, in brief, an indication of the history drawn from a tangled skein of company promotion of a not reputable kind, and which has been buried under the new Wadhurst and District Gas Company, reference must be made to the statement given in our columns on Jan. 6 last (p. 24) when we were noticing the Bill as introduced by the new Company. The members of one Parliamentary Committee before whom the Bill came had to cudgel their brains considerably before they could get a proper grip of the "past" from which the new and now quite respectable concern emanates. The names of John Luke Venables and Samuel Spencer appear among the promoting proprietors of the undertaking. In noticing the Bill originally, it was pointed out that the general purposes clause was in correct form, providing, as it did, for purchasing and dealing in residuals. But in the Act it is found that the form of the new model clause has been inserted, restricting the Company to the conversion, manufacturing, and selling of residual products. This is not in accord with the decision of the Joint Committee. A curious thing about the change is that the Bill came before Sir Harry Samuel's Committee, who put upon the South Suburban Gas Company the one-third restriction. Sir Harry Samuel was also the Chairman of the Committee who, in 1912, put upon the Annfield Plain Gas Company the complete restriction. We know that Sir Harry Samuel refused, in connection with the South Suburban Bill, to be dictated to by any Joint Committee. The capital of the Company is to be £21,000, of which £7500 of 7 per cent. stock is to be the original capital, and the balance the additional capital. The original capital is to vest in the purchaser (Mr. Venables) or his nominee or nominees; and the Company are to satisfy the debts and obligations of the purchaser in relation to the undertaking as existing at the date of transfer, provided that there is not to be allotted to him any portion of the capital in excess of £5000, unless he proves to a Justice of the Peace, within a period of eighteen months from the date of the passing of the Act, that he has expended in and about the undertaking, or in the performance of any obligation cast upon him by the Act, any sum in excess of the £5000. All the other clauses (including the references to the conditional agreement with the Receiver of the Ticehurst Company, and the consideration of £4000 for transfer) are as in our notice of the Bill on Jan. 6. Regarding the conditional agreement, it is confirmed, except that the purchaser is not to take thereunder, or have, the power of supplying gas in the parish of Heathfield, and, as regards the parish of Burwash, is subject to the proviso that the Company are not to supply in a part of this parish until they have purchased the gas undertaking now carried on by Herbert Taylor and William Walter Sixsmith. Protection clauses are given to the East Sussex County Council and the South Eastern and Chatham Railway Company's Managing Committee. The Gas Light calorific clauses, with penalties as noticed in the case of the Edenbridge Act, apply. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

For the particulars of the Whitwell and District Gas Act, we have only to refer readers, for the main part, to the review of the Bill on Jan. 6 last. They are all (save that calorific value has been substituted for illuminating power as the standard of quality) precisely the same. In addition, there are protective clauses for the Midland Railway and Great Central Railway Companies, and for the West Riding and Derbyshire County Councils. As to the clauses obtained by the latter Council, the first provision is rather a loose one:

> All mains or pipes to be laid in or along any main road or in, upon, or across any county or main road bridge shall, where reasonably practicable, be laid in such a position in any such road, or at the side thereof, and, if under the metalled portion thereof, at such depth as the County Council shall, by writing, under the hand of their surveyor, . . . reasonably direct.

What the county surveyor may think "reasonable" and what the Company may think comes within the definition of this expression may be totally different, and yet the Company might not care for the trouble and expense of arbitration proceedings to decide the point. It would have been better to have had a maximum fixed—say, of 2 feet to the top of the pipe—so as to have put a limit upon the powers of the county surveyor. As to the change from the proposed illuminating power standard to a calorific value one, the Gas Light clauses have been adopted, with the Edenbridge penalties. The general purposes clause mistakenly limits residuals dealings in the manner proposed by the model clause, which violates the Joint Committee's recommendations. [*Parliamentary Agents: Messrs. Torr, Durnford, and Co.*]

NATIONAL GAS EXHIBITION.

Appeal for Funds to Meet Deficit.

We are asked by the Hon. Secretary (Mr. Walter T. Dunn) to publish the following [second] list of responses received to the appeal issued for contributions towards the deficit in the accounts of the National Gas Exhibition.

This makes a total response to date of £313 1s. It is hoped that a large number of subscriptions will be added in the near future from undertakings which have not previously contributed.

Further Contributions from Undertakings which have Previously Subscribed.

	£	s.	d.
Bury St. Edmunds Gas Company	2	2	0
Cinderford Gas Company, Limited	1	1	0
Doncaster Corporation Gas Committee	3	3	0
Folkestone Gas and Coke Company	5	5	0
Hartlepool Gas and Water Company	5	5	0
Ipswich Gaslight Company	5	0	0
Newent Gas Company, Limited	0	10	6
Southport Corporation Gas Committee	5	0	0
Stafford Corporation Gas Committee	10	0	0
Stockport Corporation Gas Committee	10	0	0

Contributions from New Subscribers.

Castle Cary Gas and Coke Company, Limited	1	1	0
Fordingbridge Gas Company, Limited	0	10	6
Woburn Gaslight and Coke Company, Limited	1	1	0

Further Contributions from Manufacturers.

New Inverted Incandescent Company, Limited	21	0	0

ELECTRICITY SUPPLY MEMORANDA.

The British electrical industry finds itself in such a shocking mess owing to the large extent of its trading hitherto with the "enemy" that columns and columns of matter are week by week devoted by its Press to explaining what should be done and what should not be done. The industry wants to do in future what is patriotically right; but in the multitude of its counsellors there is danger. Some of the advisers hold on a long pole for inspection everything that has German name or origin, at the same time keeping their olfactory port-holes tightly closed by thumb and finger. The Council of the British Electrical and Allied Manufacturers' Association made suggestions (for which they seem to have since been sat upon by both their own members and the Board of Trade), which indicated that they, at all events, could not tolerate anything of German name or origin. The Council did not discriminate between the mere importers, agencies for the productions of German factories, and German capital invested in this country in manufacturing works which give employment and help to distribute money here—all, it was proposed, should be proscribed if more than one-half the capital is held by Germans or Austrians. No member of the Association, it was intended to decree, should buy from such firms or sell to them; and the membership roll of the Association, it was suggested, should be purified by the excision of all German or Austrian names and representatives of firms operating in or from these countries. This is a British adaptation of unadulterated Kaiserism, and reminds one of the rules issued some years ago for the guidance of the Fatherland in relation to commercial patronage, protection, and development. We are afraid that the Council of the Association are paving the way for making themselves hereafter an object for ridicule; for they, nor anybody else, could ever bring about an era of all-British trading by any violent methods of the kind. It will, we feel sure, be exceedingly unkind of any friend of the members of the Council to remind them twelve months after the war is over of the proposals they made five or six weeks subsequent to the beginning of the war. The proper and legal policy has been made delightfully plain by the defining proclamation recently issued as to what is meant by "trading with the enemy." Nothing is to be done that will enrich an enemy country, though as far as the electrical industry is concerned, the harm had been done before war commenced, by its inveterate trading habit with Germany for all sorts of things—large and small. It matters not what the nationality of the person or persons is, business must not be transacted with a person resident in an enemy country; but it may be with persons of even enemy nationality carrying on business in any other than an enemy country. No money must be paid, nor may trading of any kind be conducted which will either directly or indirectly benefit the enemy. The next stipulation covers German or Austrian capitalized concerns with works in this country. Where an enemy has a branch situated in British, allied, or neutral territory, not being neutral territory in Europe, transactions with such branch will not be treated as transactions by or with an enemy.

The Plain and Sane Way.

"Branches" and Contracts.

But there is no definition here as to what is a "branch." There are electrical firms whose roots and trunks are in Germany with small manufacturing branches here, or places called "works," which are in reality only workshops for the assembling of parts, or packing and distributing depôts. These are "branches" that mask the true source of the major part of the goods in which business is done. Business with such "branches" borders on the doubtful. But the proclamation gives power to rush off with orders to Siemens Bros.' works, to the Osram Lamp Works, Limited, and to several other largely German capitalized concerns which are situated in this country, give employment here, and bear all other responsibilities falling upon a fully British business establishment. About such works there is nothing fictitious. We do not think there should be any difficulty on the part of the electrical industry in sorting out the concerns with which it may or may not do business. But it is palpable that the war is going to inflict a considerable amount of injury on German capitalized concerns in this country. This capital has got to bear some of the effects of the loathing and horror that have been excited and aroused throughout the civilized world by the inhuman excesses of German militarism. Public opinion and public feeling are serious things against which to contend—even in everyday trading. At the same time, one must be just and judicious in regard to the concerns that have, with faith in British honour, invested considerable capital sums in works in this country. What is a very proper thing to do is, under the "Trading with the Enemy Proclamation," to cancel contracts with firms manufacturing in an enemy country. Various electricity supply concerns have already done this. Like Bradford, the Sydney Corporation have relieved a German firm of a contract for a 5000 kw. turbo-generator, and handed it over to a British firm.

Osram Lamps and German Capital.

Speaking of the Osram Lamp Works, Limited, it would be a matter of some difficulty to say whether actually this should be called a "branch" of the General Electric Company or of the huge concern in Germany that owns the master patents for the Osram lamp. Page advertisements have been published by the General Electric Company to show the public that the Osram Lamp Works, Limited, is a subsidiary concern of theirs, because certain trade competitors have pointed out that a large proportion of the capital in the subsidiary company is held by the Continental patentees. How large this proportion is, the General Electric Company do not say either in the page advertisement or in a letter addressed to the Electrical Press. But certain evening papers that have been fomenting war on Germany's trade have stated the proportion; one asserting, on the authority of Somerset House, that £70,000 of the capital out of £100,000 is held in Germany. The works manufacture lamps exclusively for the General Electric Company; and the shares in the Osram works held by the Austro-German patentees are, the General Electric Company explain, the payment exacted for patents and experience. Of course, all the General Electric Company have to say about their capital, the number of the British employees, and the number of their own British shareholders, does not dispose of the fact that a considerable proportion of the profits of the Osram Lamp Works, Limited, has been passed from this country to what are now "enemy countries." This, however, is a matter against which there is no necessity to make complaint, as it is better for the Osram lamp to be manufactured here than for large importations to be made to this country from German factories. But the fact remains that the competitors of the General Electric Company have not exceeded the bounds of truth so far as the Osram Lamp Works are concerned; otherwise the General Electric Company would have sought redress through the Law Courts, instead of through the more peaceful advertisement columns of the daily papers and the correspondence columns of the Electrical Press. What they have done is to show that it is quite true there is a large proprietorship resident in "enemy countries" of the Osram Lamp Works, Limited, and that this proprietorship has come about through no fault of the General Electric Company. Perhaps it was a sort of reciprocity in respect of benefits conferred that led the latter Company, as considerable proprietors in the Travancore Minerals Company, to find in the German Auer Company suitable contractors for the whole of their supply of the rich Indian monazite sands. It is a well-seasoned aphorism which tells us that "one good turn deserves another."

The Complete British Company.

The Edison and Swan United Electric Light Company appear to have no need to make explanations to the public regarding their capital, works, and all else—every coin, brick, and man being British. There is no doubt, however, that the Company were induced to emphasize the fact of their all-British character through the announcements (referred to in the foregoing paragraph) of the General Electric Company, and by means of the same advertisement channels in the Daily Press. It was certainly a sly dig the Ediswan Company gave the Osram Lamp Works, Limited, when saying that "there is no need to make *any apologies* in connection with the fact" that their shareholders, directors, staff, workpeople, works, and products are all British, that no share of profit is handed to a German-owned Company, and that the main patents under which all drawn-wire lamps sold in this country are made were not acquired from Germany or Austria. It may be that it would have been better for the General Electric Company if they had held their peace, and let the revelation as to the German side of the Osram Lamp Works subside without giving the opening for this further attack. However, some British newspapers are the richer for the passage of arms between rival electric lamp manufacturing companies—one of whom appears to be greatly afraid of the British public barring its products.

A Chance for the Better Quality Article.

To both the gas and the electrical industries, Kaiser Wilhelm and Emperor Francis Joseph played an unfriendly part, by not giving them warning of what was coming. Patronage of German and Austrian made lamps had been so large in pre-war times, and things had been going on in such a uniform way, that the violent severance of relationships found large parts of these industries totally unprepared. Stocks of lamps were only normal, and so were stocks of parts. This might have been altered if their imperial and imperious majesties had only whispered the word. But it is "an ill wind that blows nobody good." The patrons of lamps made in Germany have found themselves without parts for replacements; the thin stuff of which some of the lamps are made calling for rapid replacement. There are already cases on record of users of foreign made lamps who, through being unable to obtain parts for repairs, have had to purchase lamps of indigenous growth to replace the exotics. They will find that the extra few shillings spent on the former will prove a good investment in the long run. There is a direction in which the British electrical industry ought to benefit considerably. It is referred to in "Installation Topics" in the "Electrical Times." No paper at one period screeched more than this one for cheaper class wiring for middle class and cottage property, and pooh-poohed all protests that were made on account of safety and durability. Ignorance will sometimes go where angels fear to tread. Since the notes headed "Installation Topics" were made a feature of our contemporary, there has been a fresh and lusty cry—a cry that protests against the use of shoddy wiring and accessories. The writer of these notes is glad to think that one effect of the war will be to shut off the supply of these cheap class German goods, which find their richest field among the speculative builders and contractors who cut low in order to get jobs. "The builder knows and cares nothing about the quality of the installation; and the local mains engineer will connect-up the houses as soon as they are wired and the fittings attached without investigation, and after the most casual test." But now, through the war, British-made cables, switches, fuse-boards, ceiling roses, cut-outs, and other material must be used when the present stocks run out. But the costs of installations must, in consequence, increase. Now contractors will be placed on an equal footing. They must all use British-made materials. "The installation business has for too long been the dumping-ground of cheap and nasty material, and the present is an excellent opportunity for raising the standard all round."

Electrolysis and Reinforced Concrete.

An article has appeared in the "Elektrotechnische Zeitschrift," by Kurt Lubowsky, on the subject of "Electrolysis and Reinforced Concrete," the object of which was to show that the effects of the former on the latter are not great, though there are admissions that in wet places in the concrete escaping current may do damage. Investigations in America allege that iron surrounded by concrete rusts away very easily under the influence of weak currents, and this causes cracks to appear in the material. Quoting from a translation in the "Electrician," the following are the conclusions of Lubowsky: It is practically certain that when low voltages are in question, alternating currents of any kind do no damage to concrete. With direct current on ordinary voltages, the high resistance of concrete sets a limit to any electrolytic effect; in wet spots, there may be some small local damage. A grave defect in a lighting installation in a building might, perhaps, cause damage; but it is difficult to see that the stray currents from a tramway could be the source of any serious danger, seeing that the fall in voltage over a length corresponding to the front of a house must be extremely small. The danger from stray currents is probably confined to concrete bridges, where the damp lowers the resistance of the concrete to a large extent. Protection is afforded by a proper earthing of the ironwork of a bridge made of reinforced concrete, if stray currents from direct-current traction lines are to be feared. There is the case of a packing-house in New York, where cracks were detected within a year of the completion of the building; and within five years a large number of concrete girders were found to be seriously defective. This was traced to faults in the lighting installation; and there were also other unfavourable conditions. As soon as these matters were attended to, the trouble entirely ceased.

"Some Considerations Regarding Cast-Iron and Steel Pipes," by John Sharp, Wh.Sch., M.I.Mech.E., is the title of a book just received from Messrs. Longmans, Green, and Co. Pending a fuller notice of the work in a subsequent issue, it may be mentioned that there are 142 pages of text, with diagrams, and that the price is 4s. 6d. net.

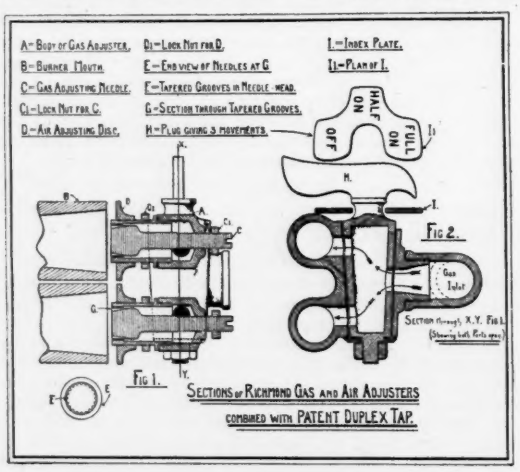
THE RICHMOND SILENT AND NEW HIGH-GRADE GAS-FIRES.

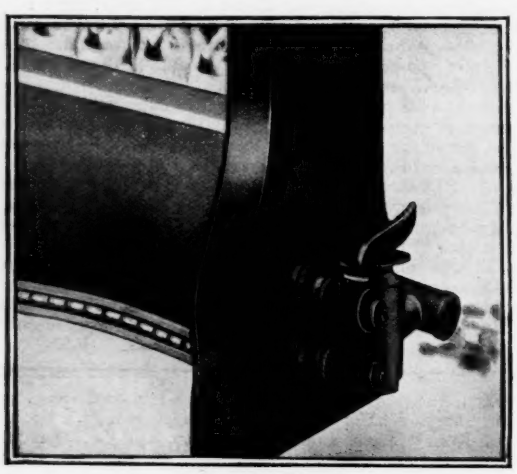
Silence the Necessary Accompaniment of Hygienic and Heating Efficiencies and Good Appearance.

THE gas-fire which complies with the standard of requirement of to-day must possess four cardinal virtues—hygienic efficiency, heating efficiency, silent operation, and an appearance that will attract and not repel. The first two virtues have been realized by most of the makers; and they are not found to be in any way antagonistic the one to the other. A great deal of attention has also been directed to realizing more attractive designs in gas-fires, and in creating greater harmony between them and the places in which they are destined to enter upon active service. Incongruity has been a very serious deterrent to an extension of the borders of usefulness into regions where harmony is studied and is insisted upon. But the silent gas-fire is a thing that all makers have not yet succeeded in realizing; and it is of growing importance. It is because of this that we have of late referred to the matter rather prominently in our pages. The "Lancet" likewise alluded to the point recently. In cultivating the use of the gas-fire in the higher class residences, there is now no complaint of heating efficiency, of smell, and of dryness of the air; but the noise of some gas-fires is said to be an abomination to the sensitive ears of the occupants of the rooms. Doctors, with an enlarged experience of the use of gas-fires, of their convenience, of their readiness to serve, of their adjustability to afford any temperature required, have largely recommended them for use in their patients' rooms; but unless there is very careful selection indeed, a gas-fire may easily find itself evicted on account of the irritation occasioned to the patient by the incessant and monotonous noise. There need to-day be no sound. Noise, indeed, should now be an unpardonable defect in a gas-fire. Proof that the noiseless burner is something that has been attained is found, in very material form, in burners that are now on the market; and their presence, and the knowledge that they can be secured, will mean a growing demand for them from both gas undertakings and their customers. The fate is sealed of the gas-fire that persists in enforcing attention to its presence through the ear; and before long all new fires will have to be silent, and old ones will have to be revised.

THE ADVANCE IN THE SILENT BURNER.

The production of mute gas-fire burners has long been a desire; but success in realizing them has only come in recent times.





The New Silencer Fitting.

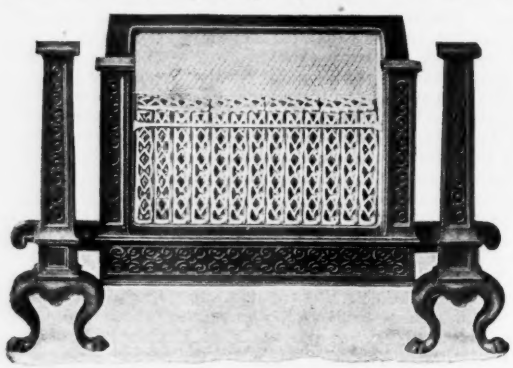
Last gas-fire season we got familiarized with the most successful attempts in this direction. To-day we see these attempts improved upon; and the fresh virtue of noiselessness an established fact. A year ago we had the pleasure of describing a fitting and a burner which the Richmond Gas Stove and Meter Company, Limited, had designed for the express purpose of suppressing noise, and which gave extremely satisfactory results. The "Lancet," it will be remembered [*ante*, p. 612], bore testimony to its efficacy in practically eliminating sound. But for the heating season upon the threshold of which we are now standing, there has been further advance. This is said not from mere hearsay, but from the evidence of our own ears with in use a burner with the new attachment.

The improved and efficient fitting, or silencer, may be briefly described. The injector is designed so that the gas flows out from the jet at a number of points on the periphery of a circle; and thus there is produced a cylindrical stream of gas which, as it passes into the burner-tube, steadily expands. The head of the controlling spindle, which is only about $\frac{3}{8}$-inch in length, is provided with a number of carefully-cut graded serrations. The spindle works in a collar of definite length; and, by screwing it forward, the gas supply is gradually completely shut off. Prior to its exit from the fitting, the gas passes down a number of short tubes; and, in this way, objectionable eddy currents in the stream of gas are eliminated, together with the noise which would be set up by the propagation of vibrations through the surrounding atmosphere. By suitable adjustment of the various parts of the fitting, the velocity of the issuing gases is reduced sufficiently to prevent the formation of these eddy currents, and yet there is induced sufficient primary air into the burner by means of the gas stream to enable the fitting to work satisfactorily at the varying pressures and with the varying gases applied in different towns.

About the new form of "silencer," besides its higher efficiency for the primary purpose, there are other commendable features. It is smaller than the device introduced last year. The tap in the original design was at the side, and now it has been placed at the top—the plug, of course, being altered from the horizontal to the vertical position. The situation of the tap not only contributes to compactness and neatness, but it enables the user to see immediately when the gas is half-on or full-on. The body of the fitting is made out of solid metal; and it is beautifully finished. Money is not wasted in making a good job of, and giving a good appearance to, such a fitting as this. Another point is that the new fitment is interchangeable with the one introduced a year ago; so that, if desired, satisfaction can be further promoted by applying it.

THE ADVANCE TO THE HIGHER-GRADE FIRE.

Coming to the new designs of fires for the approaching winter, it is seen that the Richmond Company have adopted as a settled policy not only the improvement of patterns that have become deservedly popular, but to advance continually in the higher grades of productions. This trend has been witnessed over quite a number of seasons. The Company's earlier efforts in this connection were in the direction of producing a series of fires, subject to economical maintenance, but yet good-looking, which would be suitable for ordinary or normal apartments—that is to say, apartments that are not, according to the class of house, regarded as of superlative appointment. This series of fires was known as the "A.B.C.;" and in the series, there was the introduction of the interchangeability of parts in the different sizes.

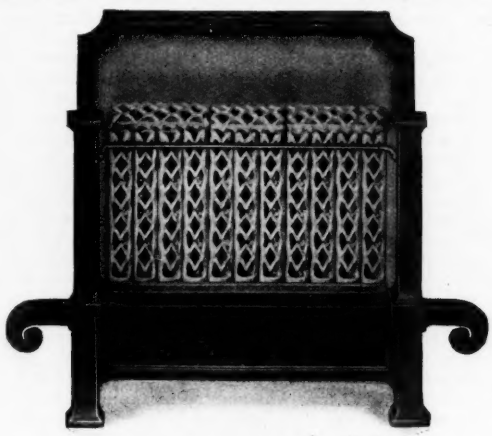


The "Jacobean" Gas-Fire (Period Series).

In other words, the parts of the different patterns of the 10-inch fires were interchangeable, and so were the parts of the different patterns of each of the other sizes of fire. The series of fires became very popular, and the big demand for them has continued. They pointed to the fact that there was a better class of consumer who wanted a fire of a design which up to that time had not been available, and that there were gas undertakings that fully appreciated the value of a good class fire, combined with interchangeability. Advancing upon the new lines and on to new ground, the first of the "Period" series of high-grade fires was developed, with its parts also interchangeable according to the different sizes; and these, too, were an encouraging success. By constructing this higher class of fires, not only was a nascent demand met, but their existence has helped to create a demand

by educating people to a better idea of the adaptability of the gas-fire to refined situations. By change to the higher class design and finish, the views of architects have also been remoulded in favour of gas-fires—a positive advantage.

Finding this line of fires well established and meeting with excellent success, the Company have shown their faith by extending the series by more elaborate styles suitable for very large houses; the object being to capture the trade in the charmingly equipped rooms of the residences of people who can afford to foot a good gas bill. In many of these houses are found some choice and wonderfully designed fire-places, for which an ordinary gas-fire would be an ill-assorted accompaniment. Fitting such fire-places, there are now such fires as the "Jacobean" and the



The "Ionic" Gas-Fire (Period Series).

heavier "Ionic." These are supplied with the new burner-fitting, which renders the gas-flames silent. The "Jacobean," as the illustration shows, is handsome; and it is powerful in its heating effects, so that it can be applied to any large apartment or lounge. The "Ionic" is of dog-grate type, and quite suitable for old world settings, and for smaller recesses than some of the other kindred types in the same series. In these designs, compliance with architectural effect, and the demand for the æsthetic, have been kept mainly in view, while also incorporating all the latest improvements to secure the round of high efficiency set by the standard of to-day. The "Flambeau," the "Louis," the "Renaissance," and other fires in the series were considered by the Company at one time to be the last word in design; but conception has no narrow limits in this line to-day, as seemed to be the case at one time, when design settled in a rut from which it appeared to be immovable.

Modernized Design for the "A.B.C." Fires.

Reverting to the "A.B.C." series, there has been a response here to the demand for rather plainer effects. This series of fires in the original design, with the features of interchangeability and ready maintenance, has helped forward the hiring-out policy. As we look at the modernized designs, we see that almost line for line the original external characteristics of the fires have been maintained. What has been done has been to eliminate the dust-harbouring ornamental indentations, and to make the surfaces plain. The plain, smooth surface, the clean-cut outline, and the gentle curve appeal to the artistic eye, and give an appropriateness to the fires for almost any normal situation. It is a matter for compliment that so little change was needed to make the original designs meet present-day demands and artistic taste. The illustrations will convey to the eye more than further words.

Boiling Burners Underneath the Fire.

A distinct advance in convenience and appearance was made by the firm when they introduced the idea of a boiling-ring underneath the gas-fires, which ring can be turned out of sight when not in use. The idea was brought forward some two seasons ago; and experience has justified the deposition of the boiling-ring from the top position on the fire to the one below. The boiling-ring is a great convenience in so many rooms, but its top or side location was a positive eyesore. Now there is no eyesore, but all the convenience is retained. Not only was it an eyesore, but the position was the means of causing a deterioration in the appearance of the fire casing when water was allowed to boil over. Another convenience is that the lower position causes the products of combustion to be readily carried away by the flue draught. All experience has justified the change.

To Sum Up.

We must compliment the Richmond Company on their further developments. Progressive firms set the pace; and an industry like that of gas supply is benefited by the quickening that successful manufacturing effort gives to popular appreciation and use. In the fires that the Company have developed, the hygienic efficiency is established. The "Lancet" tests are proof of this. The heating efficiency has been established by numerous proofs scientifically founded, and by the practical tests of public experience. There is the silent burner; it has to be tried only to be appreciated. There is the design. Our sample illustrations need no further words to applaud their excellence. More could be said; but it is unnecessary.

THE MODERNIZED SERIES OF RICHMOND "A.B.C." FIRES.

STRACHE'S GAS ANNUAL.*

This is the fourth year of publication of Professor H. Strache's "Gas Annual," and the present issue is in every respect the equal of its forerunners. It constitutes an admirable summary of all that has been done and published in connection with gas in the year 1913. Unlike many technical publications in the German language, it pays equal regard to advances in other than German-speaking countries; and we repeat the wish we expressed in reviewing one of the earlier issues of the "Annual," that Professor Strache may be able for many years to come to prepare his record of each year's progress in gas manufacture and supply.

The annual for 1913 comprises over 160 pages of text, as compared with 130 pages in the previous issue. The review of the year's progress is given as before under about forty headings. The first sectional heading is historical, and reference is made in it to the progress of the Gas Light and Coke Company since its inception a century earlier. In the second section the principles of lighting are discussed, especially with regard to the human eye. Then comes a section dealing with the phenomena of combustion and flame. In the section on pyrometry and calorimetry, it is observed that for obtaining a record of high temperatures the

* "Jahrbuch der Gastechnik für das Jahr 1913. Im Auftrage des Vereines der Gas- und Wasserfachmänner in Oesterreich-Ungarn zusammengestellt von Professor Dr. H. Strache, Leiter der Versuchsanstalt für Gasbeleuchtung, Brennstoffe und Feuerungsanlagen an der k. k. technischen Hochschule in Wien, Rat des k. k. Patentamtes." Munich and Berlin; R. Oldenbourg, 1914.

resistance thermometer is preferred to the thermo-electric, because of its greater sensitiveness in the measurement of small differences of temperature. In the section on photometry allusion is made to some of the prescriptions of the Gas Referees which have not been noticed in previous issues of the volume. It appears to be a practice of Professor Strache to introduce in his annual matter which is topical though not strictly contemporaneous; and in this way he succeeds in making the series of volumes a comprehensive record, not only of what is now doing, but also of what has been done throughout recent years in connection with gas.

Sections follow on the analysis, storage, and transport of coal, and on carbonization, including retort-settings and ovens, in connection with which special attention appears to have been given by the author to the continuous types of vertical retorts. Machinery for the handling of coke is the subject of the next section, and then washing and purifying plant are discussed. Mention is made of the new East Greenwich installation of plant for the removal of carbon bisulphide by the catalytic action of nickel; but the latest figures of the working of the process by the South Metropolitan Gas Company do not appear to have been available at the time Professor Strache was compiling this volume. The latest developments in gasholder construction are discussed fully, especially in regard to the cost per 1000 cubic feet content of holders of different sizes.

Dealing with tar and ammonia, the author refers to low-temperature carbonization processes and their effect on the quality of the tar produced. Tar and tar oils for use in Diesel engines are considered. Reference is also made to the extensive use of tar and pitch in road construction in this country, and to certain special processes for the use of tar in paving which have been tried in Germany. Several pages are allotted to high-pressure distribution—the formulæ applicable and the effect of compression on the quality of the gas being handled at considerable length. There is a short section on oil gas, air gas, and acetylene, followed by a section on natural gas. It is interesting to note that the natural gas field of Kissármás is now supplying about 56½ million cubic feet of gas per diem, a great part of which is conveyed through a high-pressure main to Budapest. The cost of the main and compressing stations was nearly £2,000,000, which was raised by a syndicate of Hungarian and English banks, and it is computed that the whole outlay will be written-off in five years. The supply of natural gas from this field is stated to be capable of displacing 60 per cent. of the coal imported into Hungary. The effect of additions of water gas on the calorific power of coal gas is referred to; and there is a short section on the production of hydrogen for industrial uses. Incandescent lighting comes in for extended notice, and there is a full record of progress in connection with high-pressure gas lighting. In a section on the comparative merits of different methods of lighting and the hygienic aspects of gas lighting, there is a good deal of matter indicating the activities of the gas publicity organizations in different countries.

Heating by gas naturally receives comprehensive treatment, and the results of tests, which have been recorded from time to time in the "JOURNAL," are quoted to show the great economy of gas as a cooking agent. In the final section of the book, which is on means of increasing the output of gas, there is an interesting comparison of gas and electricity, on the ratio subsisting between the maximum hourly output, and the total annual output. The ratio shows that the standing charges must as a whole be much more favourable to gas than to electricity.

The book concludes with an index of subjects, and an index of authors and places named in the book.

"WATER-WORKS ENGINEERING"—BY UREN.*

To deal exhaustively with such a subject as water-works engineering might easily involve the complete devotion of a lifetime, and would certainly require a breadth of experience and a depth of theoretical knowledge, the acquisition of which would leave little time for the task which was its eventual purpose.

Anyone, therefore, who endeavours to compress a survey of such a subject within the limits of 250 pages must of necessity, if he is to produce a coherent whole, select some point of view, and rigidly exclude all that comes outside his particular angle of observation. The author of this book ["Water-Works Engineering," by F. C. Uren] states quite clearly in the preface what has been his end and aim in its preparation: "To give in detail from my own practice, and that of eminent engineers, numerous illustrations and examples of small and large undertakings from their incipient stages to the completed work. I have throughout treated with special brevity the theoretical side of the question, in order to devote more space to details of actual construction." It is probably also permissible to conclude from the strictures passed upon the best books written by college professors that the work is intended specially to appeal to those having no previous knowledge of the subject.

Now, to treat water-works engineering by practical examples and yet not to assume previous knowledge in the reader, is obviously a very difficult task. Only those who have written books for beginners know how difficult it is to combine, within a reasonable amount of space, the practical details which are desirable and the complete explanation of principles which is most essential. When, as in the present case, the author has deliberately relegated theoretical considerations to a very subordinate position in his scheme, great obstacles are raised to the proper understanding of the subject. Credit is, therefore, due to the author for the considerable measure of success which he has achieved in that part of his work where he has adhered strictly to his main object; and it is hardly surprising that his success is less where he has been tempted to diverge towards theoretical investigations, for which obviously his space was insufficient to permit of adequate treatment.

A good example of this is the contrast between the chapters on "Masonry Dams," and the succeeding one on "Earthern Embankments." In the latter the method set forth in the preface is carefully followed. The principles on which these structures are designed are given in general terms and illustrated by practical examples. The result is quite good; and this chapter is probably the best in the book. Unfortunately, the same praise cannot be extended to those which precede it, and which treat of masonry dams. Here, although practical examples are given, there is no attempt to set forth the general considerations affecting this class of structure. Instead, we have a page or two of "theory," consisting principally of a formula from Molesworth, without any explanation of the premises on which it is based, and a formula of the author's also without explanation, but preceded by the statement: "If the following simple rules are observed by those designing a masonry dam nothing more is really needed, for they will be found to give results so nearly accurate that they may be adopted without risk of error." Of course, such a sweeping statement will be discounted by the qualified engineer who is aware of the disastrous failures which have taken place, and which have not always been satisfactorily accounted for, and who knows very well that, despite many and extended investigations, there still remain obscure points in connection with the conditions of stability not yet cleared up. But it is unwise, and it may be dangerous, to lead the beginner to imagine that the safe dimensions of a dam can be determined by the use of a simple formula without a sound knowledge of the problems to be solved and the conditions to be fulfilled.

This is not by any means the only case in which theory has been treated in this way, and sometimes the statements made are not free from obscurity. What, for instance, is to be made of the statement on p. 5. "Formula: $62 \times 15\ A\ (4/5\ R_m - E)$ equals relation between the gathering-ground and the quantity it will supply."

In a book not intended to assume "that the reader already had some knowledge of the subject," it is useless or worse to treat "theory" by the mere statement of formulæ unless accompanied by a fairly complete exposition of the premises on which they are based and the assumptions involved. No doubt the author has been hampered by the somewhat limited space at his disposal; but this might very well have been economized by the omission of superfluous statements (at length) of operations in elementary arithmetic—such as that on p. 3, where, after stating that the amount of rainfall is measured by rain-gauges, we are gravely informed that the receiving surface is ascertained "by measuring the surface (4840 square yards equals one square acre)," and goes on "then the area in square feet by 144 (to bring to square inches), and this by the rainfall equals total amount of rainfall (in cubic inches) on the area in a given time."

It seems a pity that the author did not content himself with informing his readers where they could find the theory and devote himself entirely to the practical details, in which evidently his chief interest lies, and of which, as a matter of fact, we can never have enough. He might then have been able to include examples of pumping machinery suitable for installations somewhat more equivalent in size to the gravitation schemes of which particulars are given. Among the latter are included those of Birmingham, Liverpool, and Bradford; whereas among the former, are only examples of plant suitable for large houses and small towns.

It is also to be regretted that there is no reference to the system of mechanical filtration which is perhaps at the present moment more in the public eye than any other, and that the chapter on "Water Softening" should rather leave the impression that the only two systems in general use are the intermittent system of precipitation in large tanks and the Permutit process. However, it is perhaps unfair to grumble at what has been excluded, having regard to the large amount of information given on the various matters covered by the title, and which will be found of interest to the practical engineer as well as to the student.

There are a large number of illustrations, which materially assist to a proper understanding of the text.

* "Water-Works Engineering." By F. C. Uren. Bristol: Castle Litho, Limited; 1914.

Liquid Fuel.—We have received from Mr. W. N. Best, of 11, Broadway, New York, a work by him bearing the title of "The Science of Burning Liquid Fuel." The author, who is an "engineer in caloric," has had many years' experience in burning all kinds of liquid fuel, and he shows, by the aid of numerous illustrations, its application to the firing of boilers and furnaces of various types and sizes. He gives analyses of the different kinds of fuels, their weight per gallon, vapourizing power, calorific value, and other technical information. The book is accompanied by a catalogue of the author's liquid-fuel furnaces and equipment.

THIN HEAT-RESISTING GLASS.

Its Manufacture in England.

In connection with the industrial war which is being waged on Germany, a prominent subject of discussion, so far as the gas lighting industry is concerned, has been the manufacture of that special thin heat-resisting glass used for globes, &c., which it has hitherto been the custom to procure from oversea sources not now available. It was with the idea of learning what they had to say on the matter that the writer some days ago paid a visit to the Farringdon Road establishment of Messrs. Falk, Stadelmann, and Co., who stated that they are now in this country producing in quantities lines in thin and light glass to stand high temperatures which have up to the present been regarded as exclusively Continental makes.

It was pointed out by a representative of the firm that, until the commencement of the war, there were no works in this country which had laid themselves out for this particular class of work, in connection with which special methods and machinery are required. The same week that the war started, however, Messrs. Falk, Stadelmann, and Co. placed with certain manufacturers in the Midlands orders of sufficiently large proportions to justify them in putting down the necessary plant for turning out this glass. Just now, adverse factors are the cost of raw material and labour scarcity. Potash, for instance, has, it is said, gone up to five times the price at which it stood before the war, and even so it is only to be had in extremely limited quantities. There is also a shortage of sand. In brief, some makers are in want of one material, and some of the other. This scarcity causes the cost to be more now than will be the case later on. At present, the special glass referred to is being produced in this country at selling prices which are approximately 50 to 75 per cent. higher than the prices charged before the war for Continental makes; but when things settle down it is anticipated that the cost will be reduced to a level which will bear favourable comparison with the foreign article—especially in view of the probability of Continental glass remaining for a long period after the war dearer than it was before the industrial dislocation came about.

An inspection side by side of globes of the two makes showed that there was no difference in appearance; but buyers need have no anxiety on this score, for all glassware of English make sent out by Messrs. Falk, Stadelmann, and Co. will bear a label proclaiming it to be so. Naturally, they are hoping that the demand for the home-made article will prove to be not merely temporary. At any rate, they intend to push it, along with the very many other British-made goods that have always found a place in their catalogue—glass, mantles, burners, &c. The obvious query as to why the move here chronicled was not made long ago, elicited the none too satisfying reply that foreigners were the first to produce this particular heat-resisting glass and put it on the market, and they have retained the advantage which being first in the field gave them. However, this is of the past. It is the present and the future that are of importance; and it is to be hoped that both the present and the future of British-made thin heat-resisting glass may be bright.

WORKS TOPICS.

By "Modus Operandi."

It is now some months since the last of this series of articles was written; but now that the winter work is again commencing, and holidays, if not indefinitely postponed owing to the war, are things of the past, I am bidden to resume my task.

Points in Trading.

There has been—and all must have hailed it with pleasure—a great outburst of feeling against trading, however indirectly, with firms who are in any way connected with our enemies. This is as it should be, not only in times of war but in times of peace; for where trade is concerned we are always at war. All of us have on occasions been offenders in this respect. In doing so we have certainly been encouraged in high quarters to disregard any obligation to trade with British firms; for the Government itself has set an example in the direction of trading in the cheapest market wherever it may be. Some may say that a strong case can be made out for taking this course of action; nevertheless this policy is disastrous to British industry. Manufacturers in this country need encouragement if they are to compete with German firms who have been financed on most advantageous terms by, or at least under the auspices of, a far-seeing Government. However this may be, the war is undoubtedly going to have the effect of encouraging to the full any spark of enterprise which may be lying latent in our midst.

The gas industry itself has been a large buyer of German manufactures; but now is the time for us to turn over a new leaf and limit our purchases to those of British manufacture. It would not be hard to prove that, even though British made goods be more expensive, the increased support of the home trade will not only have the effect of cheapening such goods in the near future, but it will also result in great indirect benefits which will accrue to the advantage of the entire British public. In the manufacture of mantles alone there is scope for the employment of scores of large factories in this country, and this in its turn would result in the consumption of many millions of cubic feet of town's gas. Such instances could be multiplied indefinitely, and need not be enlarged upon here.

Encouragement of British Manufacturers.

So far as gas-works are concerned, it is desirable and, in my humble opinion, the duty of the management to ensure that all orders are given to firms who are prepared to guarantee that the goods supplied by them are entirely of British manufacture, and made in works owned by British capital employing British labour. I would therefore suggest that all those who are of a like opinion should enclose with all orders issued by them a printed intimation to this effect:

> Dear Sirs,—As we intend to confine our purchases to goods manufactured in Great Britain by British labour in works owned by British subjects, we shall be obliged if you will, before dispatching goods ordered by us, certify that those supplied by you answer to the above description. We cannot otherwise accept delivery of any goods, in which case kindly advise us of your inability to comply with this stipulation.—Yours faithfully,

Many may disagree with the taking of any such action on the grounds that an undertaking will in some cases be debarring itself from reaping the advantage of the best markets, which are by no means always to be found in this country. Such a letter would not necessarily commit one to British articles only, but would be the means of showing the class of goods which cannot be manufactured to advantage in Great Britain, and would enable one to order with discrimination in all cases, and generally to the great benefit of British trade. Were such action to become universal, the effect would be of incalculable advantage to the trade of this country.

Local Trading.

It is possible, too, to look nearer home for many of the requirements of a gas-works undertaking. There is every reason for favouring (without, however, giving anything away) consumers of gas and coke. Such consideration meets with its own reward, and will often be the means of bringing grist to the mill. It is highly desirable that all those who have the ordering of materials should be supplied with a list of the manufacturing and other firms situated in the district of gas supply, against the names of which should be marked the gas and coke consumption for the past few years. It does not, of course, follow that those firms who are not at present consumers should be boycotted, for they may in the future become valuable customers. In any case such a step should not, and need not, restrict perfect freedom in making purchases, without which it would be highly objectionable. But a gas undertaking has thereby more to gain than to lose, as a consumer of gas is more stable than the ordinary trading customer; for, having expended money on the installation of gas appliances and being limited to the one concern for the purchase of the gas, he may in most cases be looked upon as permanent.

COKE FOR STEAM-RAISING PURPOSES.

By a Gas Engineer.

Part II.

Approaching Users of Steam-Boilers.

Having provided oneself with such preliminary data as explained before, the next step to take is to get into touch with all the steam-users, or as many as possible, in the district supplied by the undertaking. If it is an industrial district, there will be scores of firms to approach; but in any case there will certainly be a good many boilers in even a residential district.

The best means to deal with the matter is to draft a letter putting forward the advantages of coke for steam-raising, and ask for an interview to discuss the matter. The various points which should be included in the letter are the smokeless properties of coke, its cleanliness, its local production, and the increased efficiency in combustion. Some confidence must be shown in its economy as compared with coal; and in this connection it is quite clear that no fancy prices must be expected. A point in favour of coke is the fact that, being produced locally in regular quantities, there is a greater certainty of a supply being maintained than is the case with coal, which is, for the most part, supplied from a distance, and is dependent to a greater extent on freedom from strikes. This consideration is found to carry weight with steam-users, who know that so long as the coke can be conveyed from the gas-works to their own premises they are virtually sure of a supply.

As stated above, the support of local industries appeals strongly to some; and if there is a chance of a reciprocation of business, interest in the question is immediately aroused.

Increased Efficiency of Combustion.

That there should be increased efficiency in combustion where coke is used, is obvious to any practical man who considers the matter. Coke consisting of one combustible constituent, fixed carbon, it is evident that combustion is quite simple. If the fuel-bed is kept of constant thickness, and the coke of uniform size, the air supply need not be varied at all. This is by no means the

case with coal, which for its combustion requires a constantly varying amount of air. If not varied as required, smoke or soot is formed, or, conversely, a large excess of air is passed through the boiler. In any case a quantity of air considerably in excess of that theoretically required must invariably be used with coal; but in the case of coke this excess can be reduced to a minimum, as there is no fear of forming smoke or soot. As a consequence, tests will prove that the waste gases will contain a higher percentage of carbon dioxide when burning coke than when using coal. This fact alone invariably enables coke to give a better account of itself than would be expected from its calorific value. This is one of the reasons that a claim can be made for increased efficiency.

Sale Price.

Most important of all is the question of relative cost, as few (if any) steam-users, unless in serious trouble with smoke, will adopt coke unless it is clear to them that a saving can be effected. The letter must do more than hint at a saving—in fact, confidence should be expressed that, in the majority of cases, a considerable saving will be shown. Until several boiler-users have been converted to the regular use of coke, a generous spirit should be shown in adjusting the price to show a saving. So soon as a few good names have been added to the list of coke-users in the district the position will be much simplified, and better prices obtained; so that a temporary sacrifice must not be grudged. It is, therefore, desirable to state that specially favourable terms are obtainable.

The writer's experience has shown that a great deal of coke can be sold for boiler use in very large quantities at discounts varying from 10 to 20 per cent. below the current yard rates. As already mentioned, the quantity in each case is very large, exceeding considerably the quantities usually bought by regular coke-users for other purposes; so that special terms are justified, even were it not necessary on the score of competition. As will be shown later on, coke will compete favourably in some instances and unfavourably in others. Experience will soon show the state of affairs in each case, and where it is advisable to concentrate a good deal of attention. So soon as an established position has been obtained for coke as boiler-fuel in any particular district, it may be advisable to allow such customers a definite discount on the yard price. These would necessarily vary with the quantity to be taken, and obviously with cartage rates and unloading facilities. It is very advisable to sell coke for experimental use at a reduced price, so that, even on a day's trial, the user will not be put to any loss.

Instruction in Firing.

There is a further point which should be stated in a preliminary circular-letter, and that is a request for a trial of coke on the user's boilers, expressing at the same time willingness to send a practical man to give the stoker instruction in the best method of firing coke in boilers. That this service should be forthcoming is in all cases absolutely essential. If not arranged, the trial will probably be a failure, except, perhaps, in the very few cases where the head of the firm testing the coke is a man of practical knowledge and determination, and is keen on the experiment. Unfortunately, there is usually a good deal of opposition to the running of a trial even when it has been arranged. Nearly all engineers are sceptical of obtaining any result, let alone a good result. Most are convinced that it will be impossible to keep steam; and if they are shown to be wrong, they fall back on the question of economy, increased labour, and difficulty with the men. It is, therefore, of great importance that, having once obtained permission to run a trial, the most must be made of the opportunity. It should, therefore, be considered essential that a trained and practical man must attend each trial to see that full justice is done to the coke. The man in question should preferably be a trained assistant, who has personally conducted the tests on the works boilers, and is *au fait* with all the figures, and who has, further, a good knowledge of boiler firing.

The stoker will require to know how and when to fire the coke, when to clean the fires, how much air to admit, and so on. He, like the engineer, will probably be sceptical of any good result, and will be unwilling to put himself out to make it a success; so that a good deal depends on the gas undertaking's representative, who cannot be too good a man, if satisfactory results are to be expected.

After seeing what has already been written, most readers who have so far not attempted such work will have come to the conclusion that a good deal of strenuous effort will be required before results can be obtained. This is very true, but not more so than would be the case with any other new development, and should not deter anyone from making a start.

It has been shown that, before actually circularizing steam-users, many preliminary points must have been settled. There is the question of size of coke and of the trained assistant to conduct the tests. There is also the price at which such sales can be made; while there are no end of details as to the most satisfactory methods of using coke.

Interviews with Steam-Users.

Having settled such points, the letters may be sent out and replies awaited. A certain proportion will reply—some to say that coke has been tried in the past and found wanting; some to ask for the price; some to state that it would not pay them to use coke; while a few will show an inquiring interest which will lead one to expect a fair trial, if no more. By far the best course to take is to call on all those who reply, and answer all queries on the spot, making in all cases a great effort to arrange an actual trial. The boilers should always be inspected so as to determine whether the conditions are suitable. If unsuitable, nothing but harm is likely to result if a trial be made; for the news will spread that coke has been tried on "so-and-so's" boilers with absolute failure. This will obviously do a great deal of injury to the cause, especially if it is repeated in other cases. Such reports are usually exaggerated, which fact will add to one's difficulties. Therefore too much stress cannot be laid on the necessity of learning first the limitations of the article you are selling.

Particulars Required.

An examination of the boilers must be made to determine the following particulars:

Type of boilers.
Size of boilers.
Size of grate.
Forced, induced, or natural draught.
Measurement of maximum draught above grate.
Steam pressure.
Temperature of feed-water.
Quality and class of coal used.
Price of coal delivered.
Maximum consumption per twenty-four hours.
Maximum consumption per hour.
Annual consumption.
If fitted with superheaters or economizers.
Size of store.
Facilities for delivery.
Usual method of purchasing coal—by contract or otherwise.
Duty obtained from coal.
If fitted with facilities for carrying out tests.

Limitations of Coke.

A brief study of such points will quickly enable one to state whether or not coke will do the load. In some cases one can be certain one way or the other; while in others it is impossible to speak with certainty owing to the limitations of coke where a high duty is expected at certain times from the boilers with an insufficiency of draught. This being so, the position should be made clear to the user, who is then free to run a trial, and will do so in many cases, but will not on your own showing expect something which may not be realized. It is best to confine oneself strictly to the truth, as this inspires confidence, and will often be the means of inducing the firm to adopt forced draught apparatus, which will eventually make a sure success of coke as fuel. It is a very great mistake to prophesy success and for the result to be failure.

Perhaps the most important, and at the same time the most difficult, figure to obtain is the maximum quantity of coal burnt per hour; for as the strength of a chain depends upon its weakest link, so is it useless for coke to do the load for twenty-three hours and fail during the twenty-fourth. It is so often the case that in many boiler plants a very heavy load must be met at some particular time, and it is such points as this which are so often deciding factors in the matter. Some reserve of steam storage, such as is provided in a Lancashire boiler, is favourable to coke, which is by no means the case with Babcock and Wilcox, Stirling, and other tubular boilers where the load is difficult. In these latter cases there is virtually no reserve; the steam must be generated as required—a factor obviously detrimental to the use of coke, for clinkering operations practically suspend steam-raising. For such boilers, if coke is to be made a success, there must be a larger margin of reserve power, and this must be borne in mind when advising firms employing such boilers.

Cornish boilers are also disadvantageous in this respect, for when the furnace is being cleaned no steam is being raised; and unless there are appointed times when no steam is required, the whole load will be thrown on the storage in the boiler. The difficulty is, of course, diminished where two or more of such boilers are in use. In most of these cases where the load cannot be maintained, if clinkering be done in the usual manner, it is advisable to do it piecemeal, by breaking-up the clinker and pulling it out piece by piece as opportunity offers. With a little practice a stoker is able to do a section of the furnace in a few minutes without losing steam. By this means the output from the boiler is maintained practically uniform throughout the whole day. This method of working is on all-fours with the practice of pricking-up retort-furnaces frequently and thoroughly enough to dispense with complete clinkering.

It is advisable to remember that, under the most favourable conditions for the burning of coke, boilers should (1) have ample reserve power, (2) plenty of draught, (3) be of the Lancashire type, (4) be hand-fired, (5) be fitted with bars spaced at least ½ inch apart, (6) have a uniform load. These would be ideal conditions. But it must not be thought that coke will not do the work satisfactorily, even should the conditions fall very far short of the above.

Mechanical Stokers.

We come now to the mechanical stokers, all of which, we must remember, have been designed to burn coal, and not coke. These may be divided into the following classes: (1) Coking type; (2) sprinkling type. In the "coking" type of stoker, the coal is fed into the furnace automatically in small and regulated quantities.

As soon as it drops on to the grate the coal is ignited by contact with heated coal. The resulting smoke and gas passing over the coal already coked are burnt completely. In this type of stoker some mechanical means are used to convey the coal from end to end of the grate; the speed of the passage and the quantity of coal being regulated so that on reaching the further end of the grate nothing but ashes remain.

A travelling grate, as fitted to Babcock and Wilcox boilers, is a commonly adopted method, and answers the purpose admirably. As is well known, it consists of an endless chain conveyor, constructed of closely-fitted links comprising the grate.

Vicar's method is also extensively used. In this type, a short stroke reciprocating motion is imparted to the grate, by means of which the fuel is carried forward, but cannot be drawn back, owing to the dropping of fresh coal upon the vacant space left on the grate by each forward motion.

Another popular type of "coking" stoker is that known as the "underfeed." It consists of a tapered screw conveyor fitted in the centre of a furnace with fire-bars placed on each side of the conveyor, so arranged that there is a considerable downward slope from the conveyor to each side of the furnace. The fuel is fed into the furnace, by means of the screw, and is slowly "coked" in the process.

Speaking generally, the gas undertaking must be prepared to sell coke at a very low price if it wishes to supply the users of mechanically-fired boilers. The reason of this is that the mechanical stoker is a scientifically arranged device to enable boilers to be fired properly with cheap coal. Fired by hand boilers are never fired properly, and, further, cheap coal in such cases can only be used where the load is an easy one. It is all a question of burning the volatile matter in the coal in a crude furnace without making clouds of smoke. A boiler furnace is at the best of times unsuitable for burning bituminous coal. It is surrounded by comparatively cold metal, which makes it very difficult indeed to maintain a sufficient intensity of heat to enable complete combustion to be effected.

With the coking type of mechanical stokers, however, the coal is fed, and, to a certain extent, burnt, under ideal conditions. The volatile matter contained in the coal is driven off, as in a retort, and is, generally speaking, properly consumed as it passes over the red-hot coke on the remainder of the grate. By this means, coal is undoubtedly burnt under the best conditions. The heating value of the coal is made to give the maximum effect in useful work. Where such conditions prevail, the higher efficiency obtainable with coke in hand-fired boilers is nullified by the comparatively effective manner in which cheap coal can be burnt on a coking type of mechanical stoker. In such comparisons it will be found that the B.Th.U. in coal are utilized almost as effectively as the B.Th.U. in coke; so that little can be claimed for this notable advantage of coke under hand-fired conditions. The installation of the coking type of stoker enables hand-fired boilers, previously fired by high quality steam coals, to be fed on cheap coals costing quite 25 per cent. less in price.

Thus with the coking type of stoker it is difficult to compete with coal for the reasons already given, and owing to the fact that, if coke be used, it can only be used as a mixture, as the entire principle of such types of stokers depends upon the use of a fuel that will coke. The use of two fuels is invariably troublesome, and will not be countenanced unless the advantage of doing so is material. The advantage is not likely to be material unless the price of coke is very low, or unless smoke is a difficulty which in some cases, even with a mechanical chain grate, has necessitated the use of a fairly good class of coal. This is likely to prove the case wherever the boiler is working under a heavy load. In such cases, considerable indirect economy may be obtained by the use of a mixture of coke and slack fired on the principle explained by Mr. E. W. L. Nicol in the "JOURNAL" for March 3 (p. 567). This idea is a very good one, and its value should appeal to those who have trouble with smoke, or who are compelled to use high-class coal for fear of this trouble arising. It is entirely a question of the amount of volatile matter that can be burnt without smoke. If much coal must be used to raise the steam required, it is imperative that the percentage of volatile matter contained in the coal be low in amount. Thus by mixing a proportion of non-volatile fuel, such as coke (or breeze), with the coal, this factor can be readily controlled.

The sprinkling type of stoker is a mechanical imitation of shovel-stoking, and is, of course, quite suitable for firing coke or breeze, but the coke must be very small. The efficiency obtained with such stokers is not much higher than that obtained with good hand-firing, and there is no reason why coke should not be introduced in these boilers. The sprinkling type ensures good stoking, in that small quantities are regularly fired over the entire grate, which is rarely, if ever, the case with hand-firing. By this means coal is made to give better efficiency than is attained with average hand-firing, so that the competition for coke is again fairly difficult.

The underfeed stoker, though, strictly speaking, of the "coking" type, can be used for firing small coke or breeze, or a mixture of both, but, like the sprinkling type of stoker, it is designed to feed the furnace regularly and in small quantities. So that with this type, too, coal is used to greater advantage than is generally the case with hand-fired boilers. Here, again, therefore coke must be sold at a low price to compete favourably.

Taking everything into consideration, the problem of competing with coal in mechanically-stoked boilers is by no means so easy of solution as is the case on hand-fired boilers. Firstly, there is the question of the higher efficiency obtained from the coal; secondly, there is the difficulty of competing with cheap coal (so often used on these boilers); thirdly, there is the necessity of using mixtures of coal and coke in coking types of stokers; and fourthly, in the latter cases it is necessary to alter the construction of the feeding arrangements. At the same time, users of such stokers are often large consumers of fuel; so that it is well worth while to take a good deal of pains to achieve success, as the resulting orders are likely to be very substantial.

(To be continued.)

NOTES ON SEARCHING FOR A STANDARD.

By J. H. FAIRWEATHER, F.C.S.

IT will be remembered that three weeks ago I drew attention, under the heading of "Calorific Value: What is it Worth," to the very small part played by calorific value in determining the practical value of gas to the consumer. In the very same issue of the "JOURNAL" there also appeared the paper read by Mr. Walter Grafton before the North British Gas Managers' Association, dealing with the question of standards and expressing different opinions thereon.

MR. GRAFTON'S VIEWS ON ILLUMINATING POWER AND THE CALORIFIC STANDARD.

One learnt that Mr. Grafton, while apparently not opposed to a calorific standard, is of the opinion that the figure of 540 B.Th.U. placed upon it is wrong, because it is fixed upon a wrong basis. In support of this contention, we are taken through a good deal of matter upon burner construction and results going to prove better illumination by the Grafton air adjustments than by any other. The gas generally known as 14-candle gas in London is not 14-candle gas, but gas of some higher value to the extent of two or three candles. The mistake has been in not testing with a Grafton burner. Further, since the British thermal units per candle of this so-called 14-candle gas is very much higher than the British thermal units per candle of the actual 14-candle gas, fourteen times this British thermal unit per candle gives the standard of 540 B.Th.U., whereas it should only be 475.

This argument is absurd, and must be exploded. It is clever conjuring, but altogether wrong, as merely elementary knowledge would show. In any case British thermal units per candle must vary with the plant, gas, and coal. It is common knowledge that, in fixing the figure, the Committee wanted to safeguard the consumers against any make of gas materially different from that being supplied. The promoters did not plead for any reduction; they were simply concerned in obtaining relief from the illuminating power standard. The question became: What was a fair calorific basis of a 14-candle supply? And it was answered by the results of years of practical testing daily carried on in a score of testing-places throughout London. What better guide could there have been? Will anyone really suggest that 475 B.Th.U. could, in present-day circumstances, represent a 14-candle supply, or anything like it? Supposing the results given by the Grafton burner to be as claimed, it would not have made any such great difference in the figure of the calorific standard.

But further upon illuminating power and Mr. Grafton's claim. Illuminating power is not, and it never has been, the absolute measure of anything. It is simply the result of an empirical test under prescribed conditions. Alter these conditions in any way, and a different result will be obtained. Even with the No. 2 "Metropolitan" burner, as also I venture to think the Grafton burner, with all the air regulation possible by artificial means, changing the sizes of chimney, for instance, makes a great difference in the developed luminosity of the gas. The same burner also, under the same conditions of flame, will not develop the same proportion of the maximum luminosity of both coal gas and carburetted water gas. It has never been claimed by those who knew that the results given by the No. 2 burner were greater than any possibility of burner under other conditions; but certainly it was claimed, and amply demonstrated, that it gives results two candles higher than the burners statutory at the time. The industry's indebtedness to Mr. Charles Carpenter is none the less because this two candles was not four.

THE ORIGINATOR OF REGULATING THE AIR SUPPLY OF ARGAND BURNERS.

My own experience in testing different burners side by side, with different means of air regulation and different adjustments thereof, does not lead me to accept without challenge the figures submitted by Mr. Grafton in his paper; and really I am surprised that a man of his experience, and knowing so much of the importance of conditions, should have conducted experiments in the way he has apparently done. Certainly, however, credit is due to Mr. Grafton for any part he took in 1904 or 1905 in bringing to light the importance of air regulation in developing luminosity in the argand burner. What this part exactly was I do not know; but I read in the paper being considered, these words:

> "In the first place, the "Metropolitan" No. 2 burner, with the exception of the air regulator, was the outcome of the writer's own research work."

The air regulator of the No. 2 burner was, of course, its only

patentable part. What was the nature of this research work? If Mr. Grafton is claiming that, as a result of his laboratory research work, the effect of air regulation was first discovered, then I am very sorry—there was no necessity for his troubles. Credit to whom credit is due; and I say undoubtedly to the late Mr. William Thomas Sugg is the gas industry indebted for the original idea. It is rather a pity that, when Mr. Grafton took out his original patents, he did not make a more thorough search at the Patent Office. He would then have found that in 1874, Mr. Sugg (whose name, being revered by the industry, needs no introduction) took out a patent, No. 4227, from which I extract the following claims:

> "This invention consists of several improvements, in all of which the principal object is the general improvement of argand and other gas-burners, *with a view to the better development of the illuminating power in gas*."
>
> "The invention is based upon one for which letters patent No. 831, dated March 18, 1869, were granted to me."
>
> "The fourth part of the invention has reference to the construction of a cage of perforated metal which is made to surround the lower part of an argand burner, and is provided with an external perforated sheath, which on being partially turned round, or caused to slide up and down, will *regulate the quantity of air admitted to the flame*," &c.

There are a number of diagrams included in the specification which show very clearly the idea. I think I am right in saying it was Mr. James Husband, the then Engineer and Manager of the Brentford Gas Company, who first called attention to the existence of this patent. Many years ago, when the "Metropolitan" burner was introduced by Mr. Carpenter, it was my privilege (in the capacity of Chief Assistant to Mr. W. C. Young, F.I.C., F.C.S.) to test a Brentford burner with a Sugg 1874 air-regulator attached. The average of results obtained with this and other burners were as follows:

Brentford (fifteen hole) burner	13·0 candles
Sugg's 1874 Brentford burner	14·7 ,,
"Metropolitan" No. 2 burner	14·8 ,,
Grafton burner.	13·6 ,,

We may look back and think of what might have been; but I do not think that Parliament would have entertained any proposal to make this Sugg burner statutory in 1874 or for many years after.

The Calorific Standard and the Consumer.

My view of illuminating power as a standard of supply is much about the same as that of calorific value expressed in the previous article. The usefulness of either for the present is the same; but certainly if calorific value gives greater freedom in manufacture, a company is entitled to the freedom. With regard to the expression "total heat," it would appear rather unnecessary, as it is simply an accurate measure of the gross value. I remember quite well that, as a result of experiments upon calorific value conducted in Mr. Young's laboratory before the introduction of such testing in London, we discovered that different states of humidity in the inlet and outlet air and combustion products did make a difference in results. When the Boys instrument was installed in the City testing-stations, Mr. Young suggested, having regard to this fact, that the water supply should be from a tank in the room and at the same temperature. The suggestion was, however, ignored.

At the time of writing my previous article, it appeared to me that almost universally among the men of the gas industry there was some sort of idea that calorific value was the alpha and omega of the consumers' requirements. True, there had been times when experts had incidentally mentioned that this was not so; but it had not been insisted upon to any marked degree. In assigning such mistaken ideas among the bulk of the profession, I am assured by the Editor that I have "been misled by the industry's necessity for having some simple means of expressing quality in a single term, so as to comply with parliamentary requirements; and the necessity has produced the custom of speaking of quality accordingly." This may be true in cases; perhaps, in others, policy at the time had induced its acceptance, tacitly at any rate, by those who knew better. But it will not explain-away the utterances of some of the leading men of the industry, and even writings within the columns of the "Journal." It is not as an enemy of the industry that I write, but as one interested in its welfare; and, in my opinion, there is a decided danger in allowing the public, if not the partially skilled, to so associate British thermal units with value that they become one and the same thing. In the past the industry has met with much opposition in Parliament through the lacking appreciation of value by those advising and directing the local authorities and others.

As has been pointed out, the usefulness of the calorific standard for the present is that it assures the public that the make of gas with which it has been supplied for some years past will not be materially departed from. This was very necessary. However much it may appear to us that calorific value is not a measure of quality, and that the lower qualities possess greater worth to the consumer, there is no actual proof; and the Parliamentary Committee did not have any authoritative data before them. During the last fifteen years there have been many applications to Parliament for a new standard of supply or for testing instruments, reducing in every case what was quality before the introduction of the incandescent burner. These changes did not appreciably affect the efficiency of the gas in incandescent lighting. We have now reached the point when small changes in reducing so-called quality will make very material differences in efficiency in practically all uses to which gas is put, under present conditions of supply; and a halt should be made to inquire whether the industry is on the right road to ultimate success—whether the commodity at present supplied is the best that it can possibly supply. Before the present make is departed from, we want clear ideas and knowledge of the practical result and the point which is to be reached. So investigation is necessary.

In these times we are up against competition of a fairly strong kind in electricity. Economy is one of the strongest points in favour of gas, and any change in the supply which reduces the margin of economy is a blow to its progress. Big changes to a predetermined point cannot be made suddenly, but, in the nature of all growth, quietly, gradually, and by unnoticed movements. In this there must be the co-operation of the appliance manufacturers. Had such an investigation been made before the last application to Parliament, it is quite possible that another step toward progress, both in manufacture and competition, could have been made. As matters stand, there is, as I said before, a decided danger in speaking of British thermal units as quality and accustoming the public to the idea, for the simple reason that if investigation proves it to be more in the interests of the consumers—and it is impossible to disintegrate the shareholders' interests from the consumers'—that a grade of gas representing a lower quality be supplied, there may be difficulty in convincing the powers that be that it is so, and of keeping off the strength of the local authority and other opposition. The industry's progress, measured in the output of British thermal units for a penny, over the last fifteen years would not tell so favourable a story as we are accustomed to think.

My previous article was not intended to be an argument for retaining the illuminating power standard, neither was it a plea for a prescribed constitution [see "Editorial Notes," Sept. 8]. Rather I thought it pointed out that the supply could be less restricted than at present. Certainly, while criticizing calorific value, I did not suggest a standard "without complication that may be adopted in place of calorific value as a readily expressible measure of control, and so of public utility." But such criticism—unlike that of Kipling's monkeys, who found pleasure in telling their brothers that their tails hung down behind—is not without practical use. Before any alternative standard can be submitted, there must be a clearer knowledge of the ideal requirements in a public supply.

Limitation of Incombustibles and Adequate Pressure Assured.

However, the idea that we must have a rigid standard of quality arose years ago, when the use of gas was restricted to the light it gave in the argand and flat-flame burners. Without doubt at that time it was necessary to safeguard the consumers' interests by prescribing an illuminating power standard. The consumer bought "candles," and if he did not get them, he was just as much prejudiced as the purchaser of pure milk when it proved to be half water. Gas without illuminating power was worse than useless. Now conditions are changed—illuminating power is only of value to a very small and decreasing fraction of gas users; to the great bulk, no matter what gas is supplied, there is value to be found in it. Moreover, as previously pointed out, there is no reason for supposing this value to be less in the lower so-called qualities, provided that the other conditions are right, than in the richest gas it is possible to supply. I have seriously wondered whether ultimately any quality standard, other than the limitation of incombustibles, will be found necessary when adequate pressure is assured. I say this having regard to the measure of control that the statutory financial obligations of all gas undertakings gives, and which was not existing when standards were first fixed.

There is a factor which, in my opinion, is very much overlooked in assessing value to any standard—namely, the part the consumer plays. In the past this counted for little—there was not much latitude in securing good and bad results. At present, my experience is that comparatively few have much idea, or take pains in getting the most out of the gas in efficiency that it is possible for it to give. The appliances may be of the very best—they may have elaborate and, when properly used, very effective means of adjusting both gas and air; but in the majority of cases the consumer thinks his part is played when he has turned on the gas full and applied the match. Of course, if the result is bad, the blame is put upon the gas. There is tremendous waste of gas, with poorer results in illumination, through this cause. Even in the simple boiling of a kettle—a very material part of gas consumption—it is a common thing to see the gas flaring round the sides and wasting a considerable part of the heat. How many a consumer has been lost to the gas company for these reasons beyond its control?

My point is that the quality of gas which reduces the consumers' power to waste and to get bad results, should be carefully considered in fixing any standard of supply. This supply is undoubtedly the small bulk flame of increased intensity. Those undertakings at present supplying a rich illuminating power gas would do well to remember that they are placing within the consumers' power extra chances of giving gas the gratuitous advertisement of being bad. The future will, in my opinion, prove the value of small intense flames, such as would be obtained with the lower qualities of gas at an adequate pressure of supply.

LOCAL INCOME AND EXPENDITURE.

The Accounts of Borough Councils.

THIS year a considerable further improvement in respect to the time of issue has been made with the most bulky of the several volumes of Local Taxation Returns. The volume referred to is Part V., which deals with the accounts of the councils of boroughs (other than Metropolitan boroughs) and those of the urban district councils (other than town councils), for the twelve months ended March 31, 1913. As the final volume for the previous year, and some of the earlier numbered ones for the 1912-13 period, have not yet appeared, Part V. has to be taken somewhat out of its proper order. However, this cannot be helped; and some figures may now be given regarding the finances of the borough councils—leaving those of the urban district councils for notice later on.

The number of boroughs in existence at the end of the year 1912-13—excluding the City of London and the Metropolitan boroughs constituted under the provisions of the London Government Act, 1899—was 324; and out of this total, 75 were county boroughs. The receipts, other than from loans, of the borough councils for the twelve months included in the returns—not being the Exchequer contribution accounts of county boroughs, or the accounts relating to tramway, light railway, or water, gas, or electricity supply undertakings—amounted, in the aggregate, to £38,675,427, or, deducting items of receipts from other accounts of the same councils, to £34,872,067. Of the former sum, £22,044,280 was from rates; while the amount transferred in relief of rates from accounts relating to tramways and light railways, and gas, water, and electricity undertakings totalled £1,471,668. The expenditure (exclusive of that defrayed out of loans, and of Exchequer contribution accounts and accounts relating to gas, water, &c., undertakings), including money passing from one account to another of the same corporation, amounted to £38,507,753. Some of the principal items of expenditure (including loan charges) were: Public roads and streets, £5,642,203; sewerage and sewage disposal, £2,623,821; public lighting, £1,272,848. As a set-off against the profits in relief of rates already referred to, there had to be made up deficiencies in the revenue of tramways, light railways, and gas, water, and electricity works to a total amount of £350,179.

The expenditure which was charged during the year by the councils, or was intended ultimately to be charged, to loan account—excluding the various classes of reproductive undertakings already alluded to—was £4,366,979. The amount outstanding at the close of the year 1912-13 in respect of loans owing by councils (again excluding the special classes of reproductive undertakings, but including education) was £130,033,794. The sums standing to the credit of sinking funds, loan funds, and redemption funds in connection with such of the outstanding loans of the councils as were repayable by means of such funds, amounted at the close of the year to £9,697,772 in the case of county boroughs, and to £1,572,060 for the non-county boroughs concerned.

Coming to the figures that are given in the accounts of the councils connected with the reproductive undertakings excluded from the totals so far quoted—namely, the tramway, light railway, and gas, water, and electricity concerns—it may be mentioned that the receipts for the year 1912-13 (excluding sums withdrawn from reserve, &c., funds, and sums transferred from other accounts to make up deficiencies in revenue), other than from loans, and the expenditure not defrayed out of loans, were as follows: Tramways and light railways—Receipts, £7,360,257; expenditure, including loan charges, £6,706,797. Water-works undertakings, Receipts—Charges for supply of water, and rents of meters and fittings, £4,336,048; other items, £428,312; total, £4,764,360. Expenditure—Loan charges, £3,014,766; other items, £1,874,853; total, £4,889,619. Gas undertakings: Receipts—Charges for supply of gas, and rents of meters, stoves, and fittings, £5,591,216; other items, £2,457,087; total, £8,048,303. Expenditure—Loan charges, £1,288,039; other items, £5,922,567; total, £7,210,606. Electricity undertakings: Receipts—Charges for supply of electricity, and rents of meters, motors, stoves, and fittings, £4,573,628; other items, £245,099; total, £4,818,727. Expenditure—Loan charges, £1,860,811; other items, £2,834,675; total, £4,695,486. These figures made a total income for the four classes of undertakings of £24,991,647, and an expenditure of £23,502,508. The receipts include amounts received from other accounts of the same councils; but the expenditure excludes sums paid to reserve, &c., funds, and amounts transferred in relief of rates, or to meet deficiencies in revenue of other undertakings, though expenditure out of sums withdrawn from reserve, &c., is included.

With regard to loans, the total amounts expended by the councils, and the sums raised during the year under review, for the purposes of the particular undertakings now being dealt with, were: Tramways and light railways—Expenditure out of loans, £815,559; and receipts from loans, £853,825. Water-works undertakings—Expenditure, £925,240; receipts, £878,758. Gas undertakings—Expenditure, £313,105; receipts, £271,588. Electricity supply (including indistinguishable items for public electric lighting)—Expenditure, £1,276,579; receipts, £1,314,280. Thus there was a total expenditure out of loans of £3,330,483; the receipts, on the other hand, amounting to £3,318,451. At the end of the twelve months the loans outstanding were: Tramways and light railways, £22,912,035; water supply, £63,831,950; gas undertakings, £18,454,441; and electricity supply (including indistinguishable items for public electric lighting), £21,996,400. In this way, there was a total of £127,194,826 outstanding in the shape of loans. The sums remaining in sinking funds, loan funds, and redemption funds at March, 1913, to provide for the repayment of the outstanding loan debt, was £8,742,400. The reserve depreciation, and insurance funds established in connection with the undertakings here particularized totalled, on the same date, £5,838,587.

Looking at loans for all purposes, it is seen the total amount outstanding at the close of the period 1912-13 was £257,228,620, practically one-half of which is, as has already been shown, owing in respect of the four classes of reproductive undertakings that we have just dealt with in detail. At the end of the preceding twelve months, the total outstanding debt was very nearly the same, at £257,290,674, while two years before that (in 1909-10) it stood at £251,845,768. On the present occasion, in regard to the reproductive undertakings, there is very little change as compared with 1911-12. For gas undertakings, the amount of loans outstanding has decreased by about £300,000, and for electricity supply there is an increase of practically the same extent.

Based on the census of 1911, the population at March, 1913, of the 75 county boroughs was 11,246,805, and of the 249 non-county boroughs 4,588,333, or a total of 15,835,138. The total assessable value on April 1, 1912, for the purposes of borough rates or for similar levies was £80,835,556. The rates raised during the year by councils of county boroughs averaged 6s. 8·6d. in the pound. In the case of the non-county boroughs, the average was 3s. 6·8d. in the pound where the councils were not the education authorities, and 5s. 2·6d. where they were. The total amount raised was: In county boroughs, £16,789,295; in non-county boroughs, £5,254,985.

It has already been mentioned that the total transfers from the accounts of tramway, light railway, and water, gas, and electricity undertakings in aid of the rates, for the year ended March 31, 1913, amounted to £1,471,668; while there were aggregate transfers from borough, district, or other funds to make up deficiencies in revenue of concerns coming under these heads to the extent of £350,179. The profits transferred were arrived at as follows: Tramways and light railways, £513,553; water-works, £163,637; gas undertakings, £620,062; electricity supply, £174,416. On the other side, the respective items of deficiencies were: Tramways and light railways, £55,173; water-works, £275,289; gas undertakings, £561; electricity supply, £19,156. When taken in comparison with the previous year, the aggregate profits on the present occasion are substantially greater, while the deficiencies which had to be met were also a little more. Gas occupies its customary enviable positions—far ahead in the matter of profits, and equally far below others in the extent of its requirements to meet deficiencies.

Turning now to the formidable tables in the Blue-Book which set forth the profits and losses, it is gathered that of the gas-works profits transferred in aid of rates for the twelve months 1912-13, the amounts of £10,000 or over were: Birkenhead, £14,975; Birmingham, £83,974; Blackpool, £12,870; Bolton, £25,000; Burnley, £12,000; Halifax, £19,674; Leeds, £24,588; Leicester, £37,475; Manchester, £50,000; Nottingham, £39,000; Rochdale, £16,000; Salford, £43,827; Southport, £13,932; Stockport, £22,000; Warrington, £16,701; Wallasey, £17,310. From electric lighting undertakings, there are the following cases of transfers of £10,000 or upwards: Birmingham, £21,580; Leeds, £15,509; Liverpool, £30,071; Manchester, £24,500; Nottingham, £14,850. In the case of water-works, there were transfers of £10,000 or more at: Bradford, £10,600; Kingston-on-Hull, £15,000; Leeds, £12,977; Plymouth, £15,958. All the undertakings named here (with the exception of the Wallasey Gas-Works) are owned by county boroughs.

Looking now at the column in which the losses are indicated, it is seen that, out of the 104 gas undertakings in the hands of borough councils, there were only three cases in which it was necessary, for the year under review, to transfer amounts from other funds to meet any deficiencies of revenue. A sum of £74 figures in respect of that portion of their area which the Liverpool Corporation have been supplying with gas; the other two instances being Sandwich £300, and Wenlock (part) £187. As to electricity, there are 147 undertakings in the hands of borough councils; and in twenty cases deficiencies have had to be made good. The chief instances are: Bath, £1522; Newport (Mon.), £1960; Faversham, £1015; Gillingham, £4506; Heywood, £1341; Morecambe, £1925. Finally, we come to the water supply undertakings; and here there are always a good many cases of deficiencies to be met, although in the present return there are, as usual, but few instances in which the amount of the deficiency exceeded £10,000. Losses of more than this were experienced at: Birmingham, £69,038; Halifax, £13,495; Stockport, £18,100; Southport, £12,033; Swansea, £26,792; Harrogate, £14,643.

Increase of Price by the South Suburban Gas Company.—The Directors of the South Suburban Gas Company, at their meeting last Friday, decided that it was necessary to increase the price of gas by 2d. per 1000 cubic feet as from Michaelmas. That is to say, the additional charge will be included in the Christmas accounts.

CALORIFIC VALUE.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The issue of the "Journal" dated the 8th ult., is remarkable as containing two communications ostensibly addressed to the subject of calorific value of gas, both of which dodge round, rather than go straight at, the title, to such an extent that it is difficult to see the connection of some of the paragraphs with the respective headings. I refer to the article by Mr. J. H. Fairweather, on p. 562, entitled "Calorific Value: What is it Worth?"—a very interesting question to which anything but a positive answer is given; and also to a paper read by Mr. Walter Grafton before the North British Gas Managers' Association, on the "Basis which should Determine the Thermal Value of Commercial Gas," in respect to which the evidence offered is also of a negative rather than a positive character.

Mr. Fairweather deals with the composition of gas—hydrogen content, size of flame, supply pressure, and other matters—in an interesting manner, and from a novel point of view; while the greater part of Mr. Grafton's paper is concerned with investigation on the subject of how to increase the duty obtainable from an argand burner, and the final paragraph reminds one of the postscript in a lady's letter. It comprises only six lines, directing attention to a table of experiments showing how, in the working of a carburetted water-gas plant, nearly as much calorific value can be got from 1½ gallons as from 2¾ gallons of oil, by "more careful treatment of the oil in its gasification." This matter, considering that many gas companies make 25 to 30 per cent. of their supply in the carburetted water-gas house, and that others who would be glad to do as much are deterred by the high price of oil, is worthy of a paper to itself; and it is to be hoped, in the interests of the profession, that at an early date Mr. Grafton will go more into detail, and disclose sufficient particulars as to the more careful treatment to enable others to secure equally satisfactory results.

May I ask whether Mr. Grafton has extended the more careful treatment to the gas after it is made? It has often occurred to me that there is an extraordinary difference in the treatment of coal gas and of carburetted water gas. The first is cooled very gradually, by passing through a large foul main and condensers of ample capacity; while the second is rushed through a small condenser into an equally Lilliputian washer or scrubber, where it is douched liberally with water of a much lower temperature. Of the two, the enriched oil gas is the more sensitive to sudden changes, as it contains a larger proportion of easily condensable vapours. Where the coal-gas apparatus, from foul main to purifiers, is of sufficient capacity, better results might be obtained by turning the carburetted water gas direct from the seal pot into the hydraulic main, and letting it go forward with the coal gas; using a small relief holder of sufficient capacity to equalize the flow. Or, where this is not practicable, by giving it a foul main all to itself.

The chief advantage of the more careful treatment appears to be confined to the heating tests. Those on the lines of enrichment are not so evident, because the increased yield is attended by a corresponding reduction of illuminating power. If the gas from No. 5 experiment (493 B.Th.U. and 14·92-candle power by Grafton's "Ideal" burner) is used as an "enricher," what are we to expect, as regards the calorimetric or photometrical value, of the ultimate product as supplied to the district? Comparing the highest and the lowest results, by multiplying the make by the illuminating power, we get:

Experiment I. 370 × 24·5 = 9065 candle-feet per gallon.
" V. 659 × 14·92 = 9832 " " " "

About 8000 candle feet (No. 2 "Metropolitan" burner), which would be equivalent to something over 9000 (Grafton "Ideal"), is not an uncommon, but by no means a general, result with the carburetted water-gas plants in ordinary use.

So long as the bulk of the gas supplied throughout the country was produced from coal in a hand-charged horizontal retort, writers on the article now generally described as town gas had something of fairly regular composition in view. By far the larger proportion was subject to the 14-candle standard by Sugg's No. 1 "London" burner; and if 15 or 16 candles happened to be prescribed, the difference was met by the use of cannel, which had no marked effect on the composition other than a slight increase in the percentage of hydrocarbons condensable by bromine. To-day, however, there is a considerable variety of manufacturing processes, and the general similarity is no longer noticeable. Not only is there anything from straight coal gas up to an admixture of 50 per cent. of carburetted water gas, but the coal gas may be evolved from horizontal, inclined, vertical, or chamber retorts, by continuous or by intermittent processes, coupled with the use of mechanical devices in place of hand labour, to say nothing of the use of liquid hydrocarbons as enrichers.

Carburetted water gas is more simple; the various devices on this principle having a strong family likeness. One remarkable consequence of these changes is that the day has now gone by when a gas engineer could rub along comfortably, getting satisfactory working results, supplying gas of standard quality at a fair price, and paying full dividends, with no scientific testing apparatus other than a photometer and a piece of lead paper. The photometer frequently served both for works tests and for those of the official examiner, and between them had an easy life. The gas-works laboratory, which is a present-day necessity, does not lend itself to elaborate investigations of the nature indicated by Mr. Fairweather; but it does comprise apparatus for the analysis of gases, as recommended and described by Hempel, Bunte, Wanklyn, and others, quantitative methods for the estimation of impurities, Colman's naphthalene test, Wright's specific gravity apparatus, a calorimeter, &c.

Any engineer working on the lines just indicated, and running more than one method of manufacture, is depending more upon guess and rule-of-thumb than is desirable. Take as an example the common practice of making 75 per cent. of coal gas and 25 per cent. of carburetted water gas. How is it possible to know what each apparatus is doing, in the absence of means of testing and analyzing each gas separately? How can he go into questions such as the more careful treatment of oil, without proper tests of composition, calorific value, specific gravity, and so on. There should be a laboratory within easy reach of the manufacturing plant, fitted with a 15 or 20 cubic feet gasholder and suitable connections, to enable a fair sample of each gas, as being made, to be taken as required. If the set-out of the works will permit, a rapid-reading photometer at some central point, with reasonably short connections from the inlet to the coal-gas purifiers, the carburetted water-gas relief holder, and the principal outlet main, is a useful arrangement.

The line of Mr. Fairweather's argument is to bring the mountain to Mahomet, whereas the only practicable plan is that Mahomet must come to the mountain. Suppose that, after prolonged investigations, a certain composition, and certain conditions of supply pressure, had been fixed upon, and, further, that the present legal standards had been swept away. Here it may be remarked that gas engineers have not had a free hand in fixing the parliamentary regulations to which they are obliged to conform, nor have they been able to control the same as from their own point of view, without regard to the interests of the consumers. At times they have considered that certain regulations were of no advantage to either party concerned. These arrangements have always been made ostensibly with due regard to the consumer. It is no use to tell a gas engineer that he ought to do this or that, when he is under penalty to supply gas to a fixed photometrical or calorific standard, and has arranged the whole of his plant, from the retort to the consumer's meter, with a view to comply with these conditions. With considerations respecting the consumer, the question of price will always be a leading item. If the new regulations necessitate scrapping a large proportion of the existing plant, it is difficult to see how the consumer would be benefited.

Mr. Fairweather talks about 10 inches pressure at the burner; but no gas engineer would accept the responsibility of supplying an ordinary district at anything like this pressure, until all the meters had been changed for new ones and the consumers supply pipes and fittings submitted to tests that would result in the condemnation of quite 80 per cent. A gas giving a flame of known area under given conditions of consumption and pressure (such conditions being so arranged as to admit of drawing in all the air necessary for combustion at the air-holes of the burner) may be desirable, as securing an economy that would enable a cheaper gas of lower calorific power to be supplied, without any loss of duty or practical efficiency to the consumer. The practical possibilities of such a scheme are, however, slight. Already we are talking about gas for nothing; and in any case the actual net cost of manufacture is small compared with the total cost. The distribution charges are independent of the quality of the gas, and would tend to increase with higher supply pressures. Mr. Fairweather has been anticipated to some extent by high-pressure schemes, which are economical in the case of large manufacturing processes, or high-power lighting; but whether they would be found remunerative when applied to ordinary house and shop lighting, gas-cookers, and gas-fires, is another thing.

This is no reason, however, why systematic investigation into hydrogen content, flame volume, pressure, and economical consumption should be discouraged. Gas engineers are as anxious to give improved service as the consumer is supposed to be to receive it; and their endeavours to instruct the consumer and to reduce the selling price are the chief factors in the healthy and flourishing condition of the gas industry to-day.

There is no possibility—looking at the enormous variety of gas-burners in use—of having a standard that has anything like a general counterpart in practice, or that can represent at one stroke the value to the consumer. The flat-flame burner and the argand could for some years make a claim of this sort; but it is now practically obsolete, and the same fate may befall any other standard. The experience with these burners should be a warning against the selection of any special burner as a means of valuing the gas. The expression "A Thousand and One Uses for Gas" is more than a mere advertising catch phrase; and a standard presenting the qualities that experience has found necessary—such as reasonable rapidity in operation, avoidance of the personal element, and possibility of indefinite repetition accurately—if it is to be anything more than a scientific figure, cannot possibly extend beyond the bounds of broad generalization.

It appears that, in the interests of consumers, Mr. Fairweather would favour a dilution of the town gas, as usually supplied, with any mixture of combustible gas that contains a high proportion of hydrogen, if sent out at a pressure that would draw in all the air required for complete combustion at the air-holes of a bunsen burner without risk of back-firing. The exact pressure that will secure so desirable a result must first of all be determined. It has been known for years that some economy is to be found in this

direction; and the point is deserving of further investigation. I quite agree with the objection to incombustible gases, which are no advantage in the long run to any party concerned. A small percentage is unavoidable; and the entire removal of carbonic acid is not always practicable, on account of the difficulty and nuisance attending the disposal of waste lime. But, apart from this, the use of non-combustibles simply as diluents is objectionable; and there is no reason why the consumer should be expected to pay distribution charges on products that are worse than useless.

Whether the efficiency of hydrogen as compared with other gases is all that Mr. Fairweather claims is open to question. His statements on this point are not supported by the researches of Mr. Arthur Forshaw [see proceedings of the Institution of Gas Engineers 1909—"JOURNAL," Vol. CVI., p. 865]. In a table quoted, showing the duty in candles obtained from fifteen different qualities of illuminating gas by means of incandescent burners, the mixtures presumably richest in hydrogen do not take a leading place. Straight coal gas, which may be assumed to contain about 50 per cent. of hydrogen, yielded 25½ candles per cubic foot; but carburetted water gas, which contains less than 40 per cent., gave 33. Mr. Forshaw gives details of careful experiments on pure hydrogen, and on pure carbonic oxide, which corroborate these results. He found that the best duty obtainable from hydrogen was 11·7 candles, and carbonic oxide showed 17. It might be expected that hydrogen would give a better result in mixtures than when pure, on account of the difficulty in getting with pure hydrogen a flame-shape suited to the mantles. He also stated that with an ordinary burner (such as the consumers might be expected to use) carbonic oxide invariably gave a much higher duty than hydrogen.

Mr. Walter Grafton's researches on standard argand burners suggest several interesting points. His indictment of the No. 2 "Metropolitan"—a burner that for some years has been regarded as the last word—by showing the possibility of effecting a further substantial improvement, illustrates the unreliability of photometrical tests as an index of value. We might put Grafton's "Ideal" in place of the No. 2 "Metropolitan" burner, only to find after a few years that the ideal could be relegated to a second place. They also go to support Mr. Fairweather's claims for further investigation into the duty obtainable from incandescent burners. If a further regulation of the air supply does so much for the argand, it is possible that some experiments on similar lines with mantles and atmospheric burners might give equally satisfactory results. The application of an air regulator to the No. 1 "London" argand, and consequent increase of quality to about that obtainable from the No. 2 "Metropolitan" burner, is especially attractive to those engineers who are working under the No. 1 "London" as a legal standard, and are occasionally asked why they do not supply gas of equal quality to their neighbours who come under the No. 2 "Metropolitan"—particularly as it appears, from the general sense of Mr. Grafton's remarks, that they would be in order in attaching a regulator, such as that shown in fig. 1, *ante*, p. 574, to the official testing apparatus; thus securing, in place of the usual 14·5 candles, a record of over 17 candles. Are we also to understand that they would be entitled to reduce the quality of their gas to the extent of 2 to 2½ candles?

Mr. Grafton illustrates one great advantage possessed by the calorimeter over the photometer—it requires no standard burner. Another is that whereas the photometer has no second string, the results of the calorimeter can be checked by analysis and calculation. The photometer affords no corresponding method of verification. The only way of proving that the standard burner does not give the best results is to invent one that does better. Mr. Grafton makes an extremely important point in connection with the calorimeter, as to the necessity for securing complete combustion, and shows that an occasional examination of the gases escaping from the outlet of the calorimeter chamber is a desirable precaution, and also the necessity of using bunsen rather than flat-flame burners, if reliable results are to be expected.

ELECTRICAL SEPARATION OF TAR FROM COAL GAS.

By ALFRED H. WHITE, R. B. ROWLEY, and C. K. WIRTH.*

[**Extracts from a Paper submitted to the Michigan Gas Association.**]

INTRODUCTION.

Two years ago there was presented before the Michigan Gas Association a preliminary paper on the "Electrical Separation of Tar from Coal Gas"† which showed that it was possible to free gas almost absolutely from tar and other suspended particles by means of a direct-current high-tension electrical discharge, in accordance with the general principles followed by Cottrell and others for the precipitation of smelter fumes. Though the earlier paper showed the possibility of using this process, it also stated that the problem was far from being solved. Work has been continued on this problem until it has now reached a stage where it is ready to be tried on a larger scale than is possible with the resources at our command. We therefore present here a statement of the development of the process and its status, and also a discussion of the advantages which might accrue from its introduction on the large scale.

DEVELOPMENT OF THE PROCESS.

The fact has long been known that solids and liquids suspended in gases will be precipitated by a suitable electrical discharge. The first attempt at a practical use of this knowledge was made in 1884, by Walker, acting apparently on a suggestion from Sir Oliver Lodge. His patent described it as a "process for separating and collecting particles of metals or metallic compounds, applicable for condensing fumes from smelting-furnaces and for other purposes." The attempted use was to precipitate lead fumes. A Wimshurst electrostatic machine was the source of power; and the process seems to have failed on account of the unreliability of the machine.

The more recent development of electrical precipitation was started by Mr. F. G. Cottrell and his associates. His patent, taken out in 1908, calls for the following conditions for successful operation: (1) A direct-current discharge should be used, or at least there should be a long time required for the reversal of direction in comparison with the time taken for the deposition of the individual suspended particles; (2) the particles should be charged at or near the electrode about which the brush discharge appears (the "active" electrodes); (3) the particles should be deposited on a surface from which there is practically no brush or wind discharge (earthed electrode); (4) the suspended particles should be subjected to as uniform treatment as possible. The high voltage direct current was obtained by transforming the current of ordinary line voltage to the voltage desired, and then rectifying by a synchronously-driven, rotating commutator. The active electrode was given a good discharge surface by the use of strips of mica or cloth. Such an electrode was called "pubescent." Heat and a current of clean gas were proposed to maintain its insulation. Work on the above lines has been successful in the precipitation of fumes in many cases.

Professor W. W. Strong, of the University of Pittsburgh, conducted some tests in 1912-13 on an experimental scale. The results obtained which are pertinent to this paper are as follows: (1) Since the negative corona is much more uniformly distributed about the active electrode, and since it possesses greater stability as regards sparking, the negative corona discharge is much more suitable than the positive for electrical precipitation; (2) under similar conditions of the electrical circuit, the loss due to the positive corona is slightly greater than that due to the negative corona at the same voltage; (3) increasing the air velocity raises the negative sparking potential, but does not affect the positive; (4) as larger negative currents can be obtained, the negative corona is better adapted for electrical precipitation than the positive; (5) the presence of suspended matter in the gases does not greatly affect the corona currents; (6) the presence of suspended matter in hot gases increases the sparking potential, and in ordinary air lowers it.

The electrical apparatus which we used in our work was purchased from a dealer in physicians' supplies. It formed part of a set intended for X-ray work. The transformer had a capacity of 5 amperes on the 110-volt circuit, with its primary windings brought out at various points so that it was possible to obtain voltages on the secondary side varying from 10,000 to 40,000. It was operated with a variable resistance in series to allow closer regulation of the voltage. This high-tension alternating current was rectified by a commutator driven by a synchronous motor. The whole apparatus is compact, and has worked in a very satisfactory manner.

The chief difficulty in adapting this process to gas manufacture lay in the design of electrodes. The necessity of having all joints gas-tight and the danger of fire in case of a leak made the problem more difficult than if smoke or smelter fumes were being treated. The effect of tar and of water had also to be studied. The precipitating unit which seemed most advisable was made from a standard 6-inch or 8-inch gas-pipe, down the centre of which ran the carefully insulated active electrode. A fair test of the effectiveness of an electrode seemed to be obtained by visual observation in a dummy tube in a darkened room. A sheet-iron pipe, with holes cut in its sides at intervals, was placed in a vertical frame and electrically grounded. The electrode to be tested was suspended in this.

On applying the current at gradually increasing voltage to the electrodes, no visible effect was observed, nor did the milleammeter indicate any current until the difference of potential between the electrode and the grounded pipe had risen to 6000 to 10,000 volts, varying with the type of electrode. The first visible effect appeared as bright spots at points on the wires where they had been kinked or accidentally roughened. Their appearance changed with increasing voltage according to the sign of the current. If direct current was used and the wires were positively charged, with increasing voltage the glowing points became more numerous and brighter, and finally resolved themselves into distinct cones of violet rays with their apices on the wires and their bases on the pipe. As the limiting voltage was approached, the whole wire vibrated rapidly, and was surrounded by a violet haze, while the pipe seemed to be filled with the radial discharge. As the limiting voltage was reached, sparks commenced to jump across the gap, and the voltmeter and ammeter, which previously had been

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† See "JOURNAL," Vol CXIX., p. 825.

steady, swung with every spark. With the voltage still further raised, a high-tension arc was formed with a sudden and large increase in the current. If the central electrode was charged negatively, and the voltage increased as before, the bright spots on the central electrode became brighter and more frequent; but there was no appearance of the discharge rays which were so marked when the wires formed the positive pole. It was possible to carry a somewhat higher voltage when the central electrode was negative; and a slight eccentricity in its position did not so readily cause a disruptive discharge. If an alternating current was used, both the brush and the point effects were plainly seen, sometimes on the same wires. If the central electrode was hung at all eccentrically, the brush discharge appeared on the parts nearest to the earthed electrode.

It was not possible to determine the visual nature of the discharge when the electrode was in actual operation on crude gas; but a comparison of the voltmeter and ammeter readings with the apparatus in actual operation and in the observation-pipes indicated that no effective precipitation was obtained unless the wires were giving a visually active discharge. The positive discharge was somewhat more effective than the negative; but the negative was generally used in our tests, because there was less liability of a disruptive discharge. The alternating current showed itself almost ineffective in causing precipitation. Whatever may have been the effect of the electrical discharge upon the individual tar particles, it did not drive them against the wall of the pipe, so that the amount of tar in suspension at the outlet of the precipitator remained substantially as great as at the inlet.

The type of electrode finally adopted as best suited to the work consisted of a cylindrical series of fine iron wires mounted on the circumference of cast-iron discs placed at intervals along a piece of gas-pipe passing through an insulator in the top of the precipitating chamber. The general scheme of the electrode is shown in fig. 1. The wire found to give the best results, considering both quality of discharge and mechanical strength, was a tempered steel music wire with a diameter of 0·013 inch, equivalent to No. 27 or No. 28. The effect of the distance between the active and the earthed electrode was necessarily observed in connection with the above experiments. The size of the earthed electrode was varied from 6 to 8 inches diameter. The active electrodes were made 2, 3, and 4 inches in diameter.

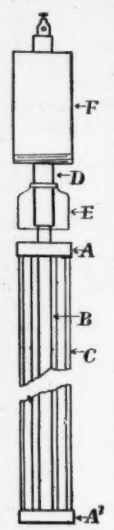


Fig. 1.—Electrode. *

Tar Precipitation.

Some of the tests on tar precipitation under various conditions were made at the Michigan Gas Association experiment station at the plant of the Ann Arbor Gas Company. In this station the gas from one of the regular retorts is led through a water-jacketed condenser through which hot or cold water may be made to circulate so that the temperature may be readily controlled. Following the condenser comes the tar-separator, a "Sirocco" blower acting as an exhauster, an ammonia washer, a purifying-box, and a station meter. The ammonia washer consists of a short tower filled with wooden grids over which water is distributed by a rotating spray; and the purifying-box is of the usual type, containing trays filled with iron oxide. The tar-separator adopted for this work consisted of a felt-jacketed 6-inch gas-pipe 6 feet long set vertically. The gas entered at the centre of the bottom through a 2-inch pipe, and left at one side near the top. The electrode was cemented into a 3-inch nipple screwed into the flange at the top of the precipitator. The electrode was of the squirrel-cage type, and consisted of ½-inch gas-pipe 4 ft. 6 in. long, carrying at each end a 3-inch iron disc with six No. 25 piano wires stretched between them. A sketch of this electrode is given in fig. 1. The maximum flow of gas from the single retort attached to this apparatus was 11·2 cubic feet per minute. This gave the suspended particles 4·7 seconds in the electrical field. Under these circumstances, a current of 1·2 milleamperes at 10,000 volts was amply sufficient to remove all the tar which had not separated in the condenser. As will be shown later, the apparatus is competent to work at many times the speed used in these tests.

The completeness of tar removal was judged by filtering one cubic foot of gas from the outlet of the separator through a filter-paper placed in a suitable clamp so that the gas was filtered through a disc of paper 2½ inches in diameter. The colour of the paper gave a good indication of the amount of tar remaining in the gas. The paper does not always remain white, even though all the tar has been removed, particularly when the tar is being precipitated at temperatures distinctly above that of a room—such as 150° Fahr.; so that there is considerable drop in temperature in the sampling-tube, and the filter-paper is frequently wet when removed. In such cases it often turns pink or blue on exposure to the air, due in all probability to the sulphide or sulphocyanide compounds.

* A. Cast-iron disc threaded from both sides. B. Gas-pipe ½ inch. diameter screwed into A and A'. C. Fine discharge wires connecting A and A', and forming the active electrode. D. Lower terminal of insulator. E. Glass insulating sleeve. F. Iron pipe into whose upper part the insulator D is cemented.

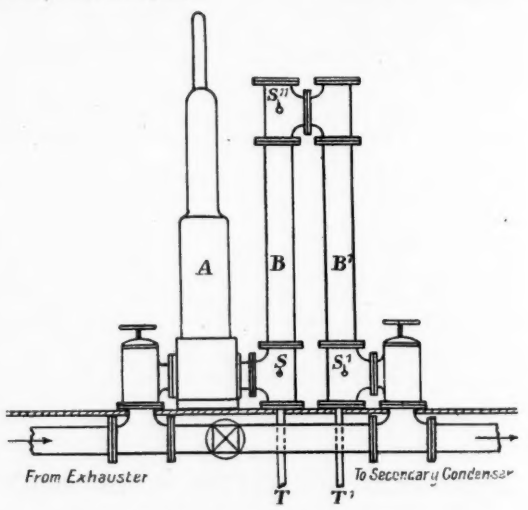
Naphthalene Removal.

The filter papers often showed a deposit of pure white crystallized naphthalene. The whiteness of the naphthalene is itself proof of the completeness of the tar removal. This naphthalene was undoubtedly present as vapour of naphthalene in the electric precipitator, and so was not precipitable. It condensed and formed crystals in the pipe leading to the filter-paper. Sometimes the whole paper was covered with a mat of these crystals to a thickness of ⅛ inch. The amount of naphthalene remaining in the gas was quantitatively estimated in several tests, and all of them agreed in showing that the gas was never completely saturated with naphthalene at the temperature of tar removal. Under the conditions of our tests, the gas was usually from one-third to one-half saturated. Towards the end of the carbonizing period, when the gas was being subjected to more drastic conditions of destructive distillation, there was relatively more naphthalene in the gas. At the beginning of the carbonizing period the contrary condition prevailed. In the usual works practice, where gas from retorts in all stages is mixed together, the extremes found in our study of a single retort would disappear.

These results confirm the investigation presented to the Association in previous years—that the tar is usually competent to remove as much naphthalene as is necessary, if it is given the proper opportunity. If the tar is removed at a high temperature or without sufficient time of contact with the gas, naphthalene may condense in free form farther on in the system. The modern tendency is towards rapid condensation and the installation of special devices to take care of the precipitated naphthalene. An electrical separator installed in the coldest point in the system will remove whatever crystalline naphthalene there may be.

Tests on a Larger Scale.

After the process had been worked out satisfactorily in the experiment station, it was transferred to the plant of the Ann Arbor Gas Company. Our thanks are especially due to Mr. H. W. Douglass, the Manager of the Company, and Mr. F. Hochrein, the Superintendent, for their co-operation and active assistance. It was, of course, necessary that there should be no interference with the regular operation of the plant, and there was very little money at our disposal. The only available place for the introduction of the electric precipitator in their system was immediately after the Pelouze and Audouin tar separator. It was recognized that it was a large step to take the apparatus intended for the experimental station with a flow of gas of 500 cubic feet an hour, and attempt to make it purify gas at fifty times this rate. There was no opportunity to make an intermediate step, however, and so an attempt was made to purify all the gas made by the Ann Arbor Gas Company.



A. Pelouze and Audouin fractional separator.
B. B'. Two 8-inch pipes, each 5 feet long exclusive of tees, used as the precipitating chamber of the electrical separator.
S. S'. S''. Sampling holes.
T, T'. Tar-drips.

Fig. 2.—Installation of Electrical Precipitator for Treating 24,000 Cubic Feet of Gas per Hour at the Ann Arbor Gas-Works.

The installation is shown diagrammatically in fig. 2. It consisted of an inverted U, built of standard 8-inch pipes and tees. The electrodes were cemented into 4-inch nipples which screwed into the top caps of the tees. The electrode found to be most satisfactory was 4 inches in diameter, and was strung with sixteen No. 27 steel wires. It was not possible, on account of ceiling height, to design the apparatus for electrodes with an effective length of more than 5 ft. 8 in. each, so that the total length of treating distance was 11 ft. 4 in. The gas made averaged 24,000 cubic feet per hour measured under standard conditions, and about 28,000 cubic feet per hour at the temperature of our tests. If no deduction is made for the obstruction caused by the central discs, the linear velocity of the gas through the apparatus was 22·6 feet per second; and the time during which the gas was ex-

posed to the electric discharge was 0·5 second. If it is assumed that the gas within the 4-inch electrode is dead, then the linear velocity becomes 30·2 feet per second, and the time of exposure to the electric discharge 0·38 second. The latter assumption is probably more nearly correct.

This installation was smaller in every way than was desirable; but it still did effective work. The negative discharge was usually employed because it was less liable to become disruptive if the electrode swayed somewhat, or was not accurately centred. The difference of potential between the wires and the grounded pipe was kept at 20,000 volts as shown by the electrostatic voltmeter. With this voltage the milleammeter on the high tension showed a current of 2·6 to 3·0 milleamperes. The wattmeter on the input side of the transformer varied in its readings from 200 to 230 watts. Very satisfactory removal of the tar could be obtained under these conditions. [The authors submitted four photographs of filter-papers. No. 1 showed the appearance of a filter-paper taken at the inlet to the electrical precipitator; No. 2 a paper taken at the top of the first leg; No. 3 a filter-paper at the outlet of the electrical precipitator. Filter-paper No. 4 was added to show the efficiency of the electrical precipitator as a tar remover, compared with the washers of the Ann Arbor Gas Company. It was taken at the outlet of the rotary ammonia scrubber after the gas had passed the secondary condenser, the tar washer, and the ammonia scrubber. A brown stain on this filter-paper showed that tar was passing all these washers and getting into the iron oxide purifiers.]

Although this apparatus thus demonstrates its ability to remove the tar, it could not, in its cramped quarters, be developed into a commercially successful unit. The voltage limitations imposed by the apparatus made it necessary to use such fine wires on the precipitator that it was difficult to get the electrodes in and out of the pipes without injury to the wires. The limitation on the length of the precipitator imposed by the ceiling height made it necessary to make the insulators shorter than was desirable, so that they were effective only when strictly clean. They were, however, constantly surrounded by the half-purified gases, and after a few hours became coated with a tar film which allowed leakage of the electric current, and usually made it necessary to shut-down after a run of about five hours. There should be no difficulty, with more freedom in design, in making an entirely satisfactory plant for continuous operation. The total expense of the electrical apparatus for purifying gas at the rate of 24,000 cubic feet per hour was less than $300, and the cost of the changes in piping and the precipitators was less than $100.

Status of Electrical Precipitation.

Our experiments have shown that it is possible to free gas completely from suspended tar particles at all temperatures up to 150° Fahr. There is no reason to believe that the process will not also be successful at higher temperatures. The electrical power required to purify 25,000 cubic feet of gas per hour is less than 250 watts, and the actual expense of the installation used by us was less than $500. The difficulties which hampered us at the close of our experimental work were due to inadequate facilities which prevented us from keeping tar-laden gas from fouling our insulators. The process has been applied commercially, and entirely successfully, to the precipitation of smelter fumes and acid mists, and there is now no doubt that it can be equally successfully applied to the purification of illuminating gas. The chief question is: "How far is it advantageous?" Any answer to this question must, from the nature of the case, be largely hypothetical, but the following advantages may be suggested.

Advantages of Electrical Precipitation.

1.—Gas absolutely free from tar may be obtained at any desired temperature. The electrical precipitator may, if desired, be placed in the gas before it has passed through any condenser. It offers the only means of removing the tar perfectly at a high temperature. The effect of this would be to leave in the gas more of the light oils and the naphthalene. If the precipitation took place at a temperature of about 175° Fahr., all the water would still be in the form of steam, and hence the precipitated tar would be entirely free from water. It would probably be more like the prepared tars used for pavements than ordinary tar. The gas thus freed from tar could be cooled either in a surface-condenser or washer-cooler. The greatest objection to the latter has been the difficulty in subsequently removing the fine tar-fog resulting from the rapid condensation of the gas. If the tar were already removed at the higher temperature, the washer-cooler would only condense some naphthalene, and possibly a little light oil. Our experience shows that this naphthalene separates in a white granular form which readily washes-out of the cooler, and which may have a commercial value. Any particles remaining suspended in the gas after the final cooling may be readily removed by a second electrical precipitation.

2.—Higher candle power and heating value may be obtained. Tar cooled in contact with the gas absorbs a certain amount of illuminants from it. If the tar is removed while hot, the gas will have a higher candle power and somewhat higher heating value.

3.—Oil washers will not be necessary. All tar-fog can be removed by an electrical separator. If the gas at the final stage of the purifying process still carries so much naphthalene in the vapour form that there may be danger of stoppages in mains and services in cold weather, a small quantity of light oil may be sprayed into the gas prior to a final electric separator. The fine drops will dissolve the excess of naphthalene, and will themselves be removed by the electrical precipitator. The quantity of the light oil may be instantly changed to suit varying conditions, and its quality may be adjusted to enrich the gas if desired.

4.—Cleaner ammonia liquor will be obtained. Ammonia scrubbers will no longer become choked by means of tarry naphthalene often mixed with mineral matter precipitated from hard water. Mineral matter from the water will be precipitated as powdery calcium carbonate. Naphthalene can only separate on account of a drop in temperature in the scrubber, causing precipitation from supersaturated gas. This will be an unusual condition; but any naphthalene thus separating will be in the form of white crystals which will readily wash out. The resulting ammonia liquor will be clean and of uniformly high strength, since the scrubber will always be operating efficiently.

5.—Direct sulphate will be possible. The direct production of white ammonium sulphate offers no theoretical difficulties, provided the gas is entirely free from tar. If either the hot or the cold gas is made to pass up a lead-lined tower down which dilute sulphuric acid trickles, a dilute solution of ammonium sulphate will result. If this solution is circulated with constant addition of a small amount of concentrated acid, the solution coming down the tower will always consist of dilute acid, with a constantly increasing amount of ammonium sulphate. In time this will become a saturated solution, and any additional sulphate formed will crystallize in the tower and separate in the cistern below.

6.—Purification will be easier. In the present system of purification by iron oxide, the purifier acts as a mechanical filter to remove suspended tar-fog. It performs this function, however, at the expense of its normal one. Oil or tar films on the surface of the oxide prevent proper contact of the hydrogen sulphide and oxide, and cut down the capacity of the box. With clean gas the efficiency of the operation will be higher and the life of the oxide longer. Wet purification also becomes more practicable.

7.—Incidental advantages. The black smoke emitted by the gas-works when retorts are being charged and producers are being fired or poked sometimes causes serious complaint. The problem of smoke precipitation by electrical means has been completely solved by the Research Corporation, and the same type of electrical equipment will answer both for gas purification and for smoke abatement.

Conclusion.

The experiments here reported have demonstrated that gas may be completely freed from suspended tar particles with an expenditure of about 0·2 kilowatt-hour per 25,000 cubic feet of gas purified per hour. The cost of installation is small, and scarcely any attendance is required. It does not seem that there will be any serious difficulty in putting the process into successful commercial operation; and the advantages in the way of better and purer gas make it extremely desirable that it should be tested on a really large scale. We have carried the work as far as is possible with our facilities, and hope that it will be taken up by others equipped to study its continuous operation with large units.

SYNTHETIC AMMONIA.

The disturbance which the great European war has caused in the facilities for the international transport and exchange of goods has affected the conditions of supply and demand of almost all industrial products, including the artificial fertilizers of which sulphate of ammonia is the most important. At the outbreak of the war, the eyes of all interested in this product were turned on Germany, where synthetic ammonia was being produced on a large scale. Sir William Crookes stated in his Presidential Address to the Society of Chemical Industry in July last [*ante*, p. 179] that the Baden Aniline and Soda Works would enlarge their synthetic ammonia plant to a capacity of 130,000 tons per annum by the end of next year. But we know also that these works have not an entirely free hand in regard to their ammonia output, for Mr. Körting, in the paper which he presented to the German Gas Association meeting at Munich a few weeks prior to Sir W. Crookes's pronouncement, mentioned that the Commercial Associations connected with the German iron and gas industries had brought pressure to bear on the Baden Works to limit its output of synthetic ammonia to a reasonable extent [*ante*, p. 30].

How the war has affected this branch of the activities of the Baden Aniline and Soda Works is not yet known in this country; but the available market for Germany's output of fertilizers must have been immensely curtailed for the time being at least. The interruption of agricultural operations over large areas of Europe has undoubtedly caused a general reduction in the demand for fertilizers; but sooner or later more intensive cultivation must be resorted to elsewhere to make good the deficiency in the crops in these areas, and there will then be a great call for sulphate and other nitrogenous fertilizers.

It may be anticipated that during the continuance of the war, Great Britain will be able to ship sulphate to meet this call, while Germany will not be able to ship it to any considerable extent. Thus it seems likely that the sulphate producers in this country will have an advantage over their chief competitors in most markets; and though the price obtainable here for sulphate is at

present low, it is probable that it will improve to an extent which will amply justify the establishment on British soil of plant for the synthetic manufacture of ammonia similar to that already successfully established at the Baden Company's works. It has been pointed out on several occasions that these works have no advantage in respect of cost of power, labour, &c., over many districts in England, and that it is only the experience gained by the Baden Company in the working of the process which in any sense puts it in a more favourable position for the synthetic production of ammonia than an English chemical-works. Bearing in mind these facts, readers of the "JOURNAL" may like to be reminded of the essential features of Haber's process for the synthesis of ammonia, which is the process which has been successfully adopted by the Baden Company. Professor A. W. Crossley, D.Sc., discussed the process, with others, in a lecture reprinted in the "Pharmaceutical Journal" in May last.

The process depends on the union of one molecule of nitrogen (derived from the atmosphere) with three molecules of hydrogen (produced by one of several modern industrial methods) to form two molecules of ammonia. This union has been effected in the laboratory for demonstration purposes for many years past; but the proportion of the mixture of nitrogen and hydrogen actually converted to ammonia has been trifling. Since, however, the union is attended with a reduction in volume, or of the number of molecules, to one-half, Haber realized that if the pressure on the mixed gases were greatly increased the percentage converted to ammonia would be proportionately increased. Thus whereas the maximum proportion of ammonia obtainable from the mixed gases at 550° C. is 0·0769 per cent. under atmospheric pressure, it is increased to 6·7 per cent. under 100 and to 11·9 per cent. under 200 atmospheres pressure. Hence, provided high pressures can be maintained in the working apparatus, the conversion of a mixture of nitrogen and hydrogen into ammonia becomes of technical value. But even if the requisite pressure is maintained, the conversion is too sluggish unless it is facilitated by the presence of a suitable catalyst at an appropriate temperature.

The Baden Company are understood to be compressing the mixture of nitrogen and hydrogen to 175 atmospheres in presence of a catalyst at a temperature of 550° C. In these conditions, about 8 per cent. of the gases passed into the apparatus are converted into ammonia at a single operation. On drawing off the gases from the compression chamber through a cooler, the ammonia is liquefied and absorbed in water as a concentrated solution. The unconverted nitrogen and hydrogen are returned to the converter. The choice of catalyst has been a determining factor in the transformation of the laboratory process into a technical one. Haber proposed osmium, and then uranium; but both were impracticable for use on the industrial scale. It is reported that reduced ferric oxide is the catalyst now used by the Baden Company, and that its activity is promoted by the presence in it of a small quantity of an oxide, hydroxide, or salt of the metal of one of the alkalis or alkaline earths. On the other hand, the activity of the catalyst is destroyed or reduced if it or the gases contain even small quantities of certain other bodies, among which are conspicuous sulphur, selenium, tellurium, phosphorus, arsenic, boron and their hydrides, lead, bismuth, and tin, certain organic compounds and oxygen compounds, with sulphur.

Even when the most suitable temperature, pressure, and catalyst for use have been ascertained and provided, there are many difficulties in the technical employment of the process. At the very high pressure adopted, the catalyzer must necessarily be of small dimensions; and since steel loses its carbon at the temperature employed, ordinary steel vessels become incapable of withstanding the pressure. As is well known to gas engineers, iron and steel at high temperatures also are pervious to hydrogen. It has not been stated exactly how some of the constructional difficulties due to these and other causes has been overcome by the Baden Company; but it is certain that they have been overcome.

The nitrogen used by the Baden Company is obtained from the atmosphere by the Linde process of fractionation by refrigeration, supplemented by passage over heated copper. The nitrogen must be free from even slight amounts of oxygen, since at the high pressure prevailing in the converter explosions occur if oxygen is present. The hydrogen required is obtainable by one of several processes, the chief of which have been described by Professor Crossley in the lecture already referred to. Freedom from oxygen being essential, the electrolytic method of obtaining hydrogen is unsuitable, since it yields a product containing about 1 per cent. of oxygen.

There are, however, two methods of producing hydrogen which are free from this objection, and are otherwise well suited for preparing hydrogen of a sufficiently high degree of purity for use in the synthesis of ammonia. The first of these methods is by the Linde-Frank-Caro process, in which gas rich in hydrogen is obtained from water gas by cooling it by liquid air. The carbon monoxide, nitrogen, and other constituents of the water gas liquefy at a higher temperature than hydrogen, and are condensed while the latter is left in the gaseous state. Small amounts of carbon monoxide in the hydrogen thus obtained are removed from it by passage over heated soda-lime; and the hydrogen thus purified is stated to contain 99·2 to 99·4 per cent. of real hydrogen, with 0·6 to 0·8 per cent. of nitrogen as the only impurity.

The second noteworthy method of producing hydrogen is that of Bergius, which depends on the action of liquid water on iron at a temperature of 300° to 340° C.; the pressure being maintained sufficiently high to keep the water in the liquid state. The iron combines with the oxygen of the water; the hydrogen being liberated. The oxide of iron is subsequently reduced by water gas or other reducing agent to iron for use again. The hydrogen obtained by this process on a commercial scale is stated to contain no more than 0·01 per cent. of impurities. The cost of making hydrogen by this process is claimed to be considerably lower than that of hydrogen obtained by the Linde-Frank-Caro process; but Bergius's process has not yet been adopted on so large a working scale as the latter, and it is questionable whether the costs of manufacture have been compared on the same basis.

BYE-PRODUCT COKING INDUSTRY.

Relation of the Industry to Iron and Steel Manufacture.

As mentioned in the "JOURNAL" a few weeks ago, one of the papers prepared for the autumn meeting of the Iron and Steel Institute was on the subject of "The Bye-Product Coking Industry and its Relation to the Manufacture of Iron and Steel;" the author being Mr. G. STANLEY COOPER, B.Sc., of Sheffield. Owing to the present disturbed condition of affairs on the Continent, however, it was decided not to hold the meeting; but copies of the papers to be submitted have been distributed, and the following are some extracts from the one just referred to.

The author began by pointing out that the standard of efficiency which has been reached in connection with iron and steel works at the present time is a result of the more economical application of existing resources rather than of anything entirely new; and he remarked that perhaps the most striking development has been in connection with the fuel side of the industry. In his paper he confined himself to the production and use of coke-oven gas for metallurgical purposes. Until comparatively recent times, very slight attention was paid to the surplus coke-oven gas; and though it was generally assumed that 50 per cent. of the total quantity of gas evolved from the coal was available over and above that required for heating the ovens, very little of it was actually used. When it came to be realized that this gas could be employed as a fuel for open-hearth and other furnaces, more attention was paid to the question of gas production in bye-product coke-ovens; and consequently better efficiency was obtained from them—at any rate so far as yield of gas was concerned.

The natural consequence of the efforts to increase the surplus yield of gas was the provision of other means for supplying the heat necessary to carbonize coal in coke-ovens, and thereby to allow the whole of the gas produced to be available for extraneous purposes. An exactly similar position, but one looked at from another point of view, had arisen in connection with the gas industry. The result was the development of the regenerative type of oven, and the carrying out of many improvements therein. At the Allerdale Coal Company's colliery, a battery of fifty Koppers regenerative ovens was set to work in 1911; and the Manager (Mr. F. D. Harper) supplied figures showing the results which may be expected from using this kind of oven.

The author then explained, with illustrations, the construction of the Koppers regenerative coke-oven, gas-oven, and combination oven operated on blast-furnace gas, all of which have already been fully described in the "JOURNAL"—the last as recently as March 24. He subsequently passed on to deal with

THE CARBONIZATION OF COAL IN COKE-OVENS.

As long as the primary object is the production of metallurgical coke, so must the selection of a suitable coal for use in coke-ovens be of prime importance. Many investigations have been carried out with the object of determining what constitutes the coking property of coals, and what are the reasons for the varying behaviour of different classes of coal on carbonization. Finality in the matter has by no means been reached; but it is possible, as a result of collected experiences, to lay down certain general rules concerning the relationship between the composition of coal and its coking capacity. Perhaps the most important of these is that as the oxygen content increases the coking power decreases; and it is generally assumed that a coal with more than 8 per cent. of oxygen on an ash-and-moisture-free basis is a non-coking, or at any rate a poor coking, coal.

This view is further borne out by consideration of the results obtained in the distillation of various classes of coal. The oxygen

Coal.	Coke Per Cent.	H_2O Per Cent.	CO_2 Per Cent	CO Per Cent.	Remarks.
Cumberland	69·8	5·34	0·94	6·0	Good coke
Durham	76·5	4·11	1·02	4·6	" "
Warwick	62·0	12·98	3·60	10·6	Poor coke
Monmouth	80·0	3·37	0·51	3·2	Good coke
Staffordshire	71·0	7·53	1·08	4·9	" "
Yorkshire	70·0	6·66	1·28	7·8	" "
Lancashire	70·0	6·80	1·48	5·2	" "
Lanark	65·0	8·09	2·45	10·7	Fair coke
Fife	68·0	9·12	1·99	7·6	Good coke
Northumberland	67·0	8·55	2·46	7·8	Fair coke
Forest of Dean	68·0	6·73	1·58	7·5	" "
Brown coal (Australia)	48·0	12·78	8·22	23·0	Poor coke
Leicester	63·0	10·52	2·74	12·4	" "
Lancashire cannel	63·0	6·19	0·56	5·6	" "

in the original coal is distributed on distillation in the form of H_2O (ammoniacal liquor), CO_2, and CO. The following results were obtained by the author with different classes of coal. It will be seen that, speaking generally, the figures for H_2O, CO_2, and CO are a good guide as to the coking property of the coal. The tests were all performed with dry coal and under the same conditions.

In a large number of tests carried out by the author, the general conclusion arrived at is that if the yield of H_2O from the dry coal on distillation is more than 7 or 8 per cent., the coke produced is of an inferior character. There are a few exceptions to this generalization; but, on the whole, it is quite a satisfactory guide. The majority of Scotch coals behave in a very peculiar way. If the coal be ground up and carbonized immediately, a good coke is obtained. If, however, it be allowed to be exposed to the air for any length of time, and particularly if it be in a finely-divided and moist condition, its coking power deteriorates very considerably. Indeed, the author has found that coal which will produce good coke when treated immediately after grinding will scarcely cohere on being carbonized after a day or two's exposure; the reason probably being that the coals absorb oxygen from the air on exposure. This view is borne out by the fact that the yield of liquor on distillation is greater after exposure than before. Consequently, it is important with such coals to take precautions against the effect of atmospheric exposure, and to carbonize the coal as soon as possible after it comes from the mine.

Many attempts have been made to convert non-coking into coking coals; but, so far as the author is aware, they have not been commercially successful. It is possible, by the admixture of a quantity of pitch, to produce a passable coke from a poor coking coal; but this method is expensive, and could hardly be carried out on a large scale. The deleterious effect of weathering on the coking property of coals has already been mentioned; but the change from a coking to a non-coking coal may be brought about by other very simple means. If a coking coal in a fine state of division is exposed to a temperature of about 200° C. for (say) two hours, it is found that the coking power has practically disappeared. Coal under such conditions gradually increases in weight up to a certain maximum—the percentage increase varying with the class of coal—and then begins to decrease again. When the maximum weight is reached, the coking property is generally completely destroyed. In the case of the best classes of coking coal, these still retain a little coking power even after long heating.

For each coal also there appears to be a limit or some critical temperature, and when heated above it the coking property is seriously impaired. For ordinary classes of coking coals, such as those of South Yorkshire, this temperature is about 150° C.; but the effect is much more pronounced at 200° C. The size of the coal carbonized has also a marked effect on the quality of the coke produced, especially with those coals which possess only moderate coking properties. The author performed experiments with a Scotch coal, divided into four portions, one through a 90 mesh, one through a 60 mesh, one through a 30, and one below 30. The samples were arranged in order in a distillation tube, and separated by a thin cotton-wool plug. They were then carbonized in the usual way. The resulting coke was different in each case, and the larger-grain coal produced the best coke; the quality of the others deteriorating as the size decreased. With such classes, compression of the charge is necessary in order to produce a suitable coke; and with compression it is possible to treat many such coals in coke-ovens which otherwise could not be so utilized.

Different coals behave in different ways when carbonized under the same conditions, and consequently the method of treating the coal has to be adapted to the particular class of coal to be dealt with. The average Durham coal is charged into the ovens in a normal state—that is to say, containing about 2·5 per cent. of moisture, and crushed to a degree of fineness of about ⅜ to 1 inch. The coal is not compressed in any way, and a good, hard, dense coke is produced. The coke is of about the same volume as that of the coal, and no difficulty is experienced in pushing the coke from the ovens. In South Wales the coal is charged into the ovens in a similar way, but has a tendency to swell on being carbonized. Unless care is taken, therefore, the oven walls might be damaged, and difficulty will also be experienced in pushing the coke from the ovens. In Cumberland still another variation is met with. There the coals contain about 30 per cent. of volatile matter, as against about 25 per cent. in Durham, and 15 to 20 per cent. in South Wales. If the coal is charged into the ovens as in Durham, the coke produced is soft and friable, and will not stand much handling. In order to produce a harder and denser coke, the coal is compressed into the form of a cake containing about 10 per cent. of added moisture, and so charged into the oven. The coke obtained by treating the coal in this manner is quite suitable for furnace work.

Recovery of the Bye-Products.

Until about the year 1903, the method adopted on coke-oven plants for the recovery of the bye-products was similar to that which is still in existence in gas-works. The gas, after leaving the ovens, was passed through coolers, and its temperature reduced to about that of the atmosphere; thereby removing the heavier tars, and also the moisture contained in the gas. The moisture which was deposited dissolved out of the gas a proportion of the salts of ammonia which it contained. The gas was then passed through scrubbers, and was well washed with water until the whole of the ammonia was eliminated and obtained in the form of ammoniacal liquor. In order to recover the ammonia from this liquor, it had to be treated in a separate apparatus, and was distilled with milk of lime. The ammonia gas liberated from the liquor passed into the sulphuric acid, when sulphate of ammonia was formed.

Obviously this process is a roundabout one, as the ammonia is first dissolved in water and then expelled therefrom. In the "Journal of the Iron and Steel Institute" for 1883 there is an abstract of a paper by Mr. R. Tervet, in which he predicted the ultimate abolition of this system, and forecast what is known throughout the world as the direct-recovery process. It was not until about 1905, however, that the direct-recovery process was satisfactorily operated on a commercial scale. In this process the gas is passed directly into sulphuric acid; thus obviating the necessity of washing-out the ammonia by means of water.

Several types of direct-recovery process are now in operation, and the first to meet with commercial success was that designed by Mr. Koppers. This process has since been largely adopted, and at the present time deals with the gas from upwards of 20 million tons of coal per annum. Strange to say, in spite of the marked advantages which this process offers over the old system, and the fact that it has been largely adopted on coke-oven plants in Great Britain, not a single gas-works of any size in this country has yet discarded the old system in favour of the new one. A start has, however, been made on the Continent; and at the new works of the city of Budapest the Koppers process is in operation, dealing with the make of 9½ million cubic feet of gas per day. [The author described the system by the aid of the diagram which appeared in the "Journal" for Oct. 21 last.] The sulphate produced by the process is far superior to that obtained by the old system; and, owing to the fact that the gas is thoroughly free from tar before entering the saturator, a perfectly white salt is invariably produced.

After a brief reference to the ammonia-recovery systems of Burkheiser and Feld, which seem to the author to be somewhat too complicated for general adoption, though he believes that ultimately such a process will obtain, he proceeded as follows: The recovery of benzol has received much attention of late, owing to the fact that a large quantity of refined benzol is now being used in place of petrol as fuel for motor engines. The majority of coke-oven plants now have benzol-recovery plants, but very few produce refined spirit; what is known as "crude" or "65 per cent." benzol being generally made. The benzol can be extracted from the gas without affecting the amount of energy obtained from it, when used for boiler-firing purposes or for combustion in gas-engines, by more than about 5 to 10 per cent. The quantity of benzol obtainable differs, of course, according to the nature of the coal. In South Yorkshire, Derbyshire, the Midlands, and Cumberland, the yield is about 2½ to 3 gallons of crude spirit per ton of coal; in Durham it is about 2 to 2½ gallons; in South Wales it is usually only about 1 to 1½ gallons.

The recovery of benzol from coke-oven gas is now universally effected by means of absorption in creosote oil—a product obtained in the distillation of coal tar; and the difference between the various systems on the market lies principally in the internal arrangement of the apparatus employed, and the temperature and steam pressure at which the various parts are worked. In some cases rotary washers are substituted for the tower scrubbers mentioned in the following description.

The method employed for the recovery of benzol consists of the following stages: After passing through the saturators, the ammonia-free gas is conducted to final coolers, where the temperature is reduced to a degree required for the efficient extraction of benzol. The cooled gas then enters a series of tower scrubbers, inside which are a number of boards, in order to ensure an even distribution of the scrubbing oil and the complete extraction of the benzol. The oil is circulated by means of pumps, and is fed into the scrubbers at the top through sprays. The oil flows in counter-stream to the gas, and by the time the latter has passed through all the scrubbers the benzol is completely extracted from it. The enriched oil containing the benzol passes to a storage-tank, whence it is pumped into a preliminary heater, where its temperature is raised to about 60° C. It then goes to the superheater, where it is heated to a temperature of about 135° C., after which it runs over into the still. By means of live steam the whole of the benzol is driven off; the debenzolized oil then flowing out at the bottom of the still. This weak oil is cooled and used again for scrubbing purposes.

The benzol vapours, together with some water vapour, leave the still and enter a heat exchanger. In this apparatus the heat contained in the vapours is transmitted to rich oil, and the vapours are thereby cooled down considerably, led into a final cooler, and condensed to the liquid form. The benzol and water thus obtained pass to a separator, where, by reason of the difference in specific gravity, the two are entirely dissociated. The benzol so obtained is known as "crude spirit," and is usually of about 65 per cent. strength. When a refinery is available, the crude benzol is not produced higher than 50 to 60 per cent. Up to this point the process is continuous, and can proceed without interruption for any length of time—a little fresh scrubbing oil being added occasionally, and some of the old oil removed.

If it is desired to produce a refined spirit, it is necessary to submit the crude benzol to processes of redistillation and purification. The crude spirit runs from the separator into a storage

tank, and from there is pumped into a still of large capacity. This is heated by means of steam-coils. The benzol vapours pass into a dephlegmator, in which separation of the various constituents takes place owing to the different temperatures at which they boil. In order to produce the higher boiling homologues of benzol, further distillation under a partial vacuum by means of live steam is resorted to. The vapours leaving the dephlegmator are condensed and run into the various tanks. The products so obtained are benzol, toluol, xylol, &c., and each of these is now heated separately in order to produce a refined spirit. A pump delivers the spirit to an agitator, where it is washed with sulphuric acid. After allowing an interval for separation, the acid is run off, and the spirit is treated with caustic soda and finally with water. By finer dephlegmation and slower distillation in another still, the washed spirit is fractionated, and the products known as 90 per cent. benzol, 90 per cent. toluol, solvent naphtha, &c., are obtained. In order to produce pure benzol, toluol, &c., for chemical purposes, further fractional distillation is necessary; but these products are seldom, if ever, manufactured in coke-oven plants.

In the stills from which the crude benzol is first redistilled a certain quantity of hydrocarbons, consisting mainly of naphthalene, settles out and is brought to a centrifugal machine and dried. The oily matter remaining is run back into the scrubbing oil and used for scrubbing purposes. The sulphuric acid used for washing the crude spirit can, after a time, no longer be used for this purpose. It is run into lead-lined pots and heated by live steam, thereby being freed from hydrocarbons. The cleaned acid is then used in the saturator for the manufacture of sulphate of ammonia.

Use of Coke-Oven Gas in Iron and Steel Works.

Coke-oven gas is now largely used as a fuel in iron and steel works; but the author prefers to leave detailed statements with regard to the suitability of coke-oven gas for this purpose to those engaged in its employment. There is no doubt, however, that the use of coke-oven gas is increasing very rapidly indeed, and the tendency is becoming more and more pronounced for iron and steel works to manufacture their own coke and utilize their own coke-oven gas in the steel-works. Coke-oven gas has been used in open-hearth furnaces with great success—in some instances practically replacing the whole of the coal formerly used. In a communication from the Dominion Iron and Steel Company, Limited, of Canada, the author is informed that the surplus gas from the coke-ovens is used entirely in the steel department. The calorific value of the gas is about 525 B.Th.U. per cubic foot; benzol not being extracted. In this connection, it will perhaps be remembered that the President of the Institute, M. Adolph Greiner, emphasized particularly, in his Presidential Address at the May meeting,* the enormous economies possible through bye-product coke-ovens, and the great opportunities for the development of the bye-product industry.

* See "Journal," Vol. CXXVI., p. 422.

THE CLINKERING OF COAL.

In an article in the "Mechanical Engineer," this subject has lately been dealt with by Mr. O. W. Palmenberg. The following abstract of his communication appears in the current number of the "Journal of the Franklin Institute."

One of the most troublesome features in the combustion of coal is due to the production of clinker. This influences the rate of combustion and the cost of maintenance, especially where automatic stokers are used. A coal may clinker so readily under certain conditions that it becomes unfit for use, irrespective of its fuel value. It is therefore of the greatest importance to know whether a coal will clinker under the conditions for which it is required.

The determination of the clinkering properties of a coal—that is, whether its ash will fuse at a low temperature—has been carried out in several ways; and many authorities have considered that an analysis of the ash, or the determination of the iron in the ash or of the sulphur in the coal, would furnish the desired information. To show that there is no relation between the clinkering quality of a coal and the sulphur or iron content, the author made independent investigation of the problem. Analyses of the ash, together with the fusing temperature determinations on a wide range of coals, show that no conclusions can be drawn from a chemical analysis. It may be noted that some coals have ash of like iron contents and variable fusion temperature, while others have ash of like fusion temperature and variable iron content. It would appear, therefore, that there is no relation between the percentage of the various constituents of the ash and the fusing temperature. Hence chemical analysis is of no value to arrive at a judgment as to the clinkering quality of a coal.

The fusion temperature of the ash ought, therefore, in the future, to displace the sulphur determination in coals used for steaming purposes; and this change will readily show the fallacy of buying and selling coal on an analysis basis, where specifications are used containing sulphur tables penalizing beyond a certain guaranteed amount of sulphur. It has been quite a common practice to place 1·5 per cent. of sulphur as a limit, and to penalize the seller as much as 4 c. per ton for every 0·25 per cent. of sulphur above the limit. The injustice of this practice is evident, as it often happens that coals with a high sulphur content are extremely high in heat value, and do not clinker readily.

Since the sulphur has no appreciable effect upon the metallic parts of the furnace, it need not be considered in the selection of a coal for steaming purposes. To arrive at the value of a coal for this purpose, it is therefore just as essential to make the fusion test of the ash as it is to make the calorimetric determination. If these two determinations are made, an explanation is readily found as to why two coals of apparently like proximate analyses give entirely different evaporation when fired under like conditions.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Dublin Gas Affairs.

Sir,—No one can be surprised at Mr. Edwards's disappointment at the absence of any dividend. But he must allow that we are indebted to the new Directors for at last receiving a set of accounts that do very nearly reveal the actual condition of the undertaking.

I, personally, rejoiced to learn that Mr. Cash (who alternatively with Mr. Burton I urged on the old Board eighteen months ago) was investigating the financial position. I knew that the outrageous suppression of income and expenditure from the knowledge of the shareholders must be stopped, and their extent revealed; and now what does the statement show? First, that the capital account was muddled; for the initial figures are all different from those of a year ago. Second, that a large unacknowledged fund of £37,000 for pensions existed, and was positively invested (partly) in the name of an officer. Not a line or a figure of this is shown at June, 1913. Third, that there were claims against the Company unacknowledged in the old balance-sheets.

In the revenue account there stand two items, rents of stoves and fittings, amounting to £8500 in the half year, which were never given before, and therefore the expenditure of it which one supposes was formerly used in surplusage of the £21,734 shown to be spent on these subjects (if indeed it was not wasted or misapplied) is now confined within the figure given—viz., £22,403. I cannot find that the £3000 depreciation for stoves and fittings at 10 per cent. per annum on £60,000 of capital value, at all covers an adequate amount; for if Mr. Murphy's statement at the last meeting be true, that the coin-meter installations number 39,000 and cost, as I believe they did, £8 apiece—and an examination of the capital account will more than confirm this figure, because the whole additions for ten years past were needed for little or nothing else, as the sale of gas has not grown in any other direction—they must represent £300,000, and should require at 10 per cent. per annum £15,000 in the half year. On this point the information that I asked for after the last meeting, as to Mr. Murphy's statement, should now be forthcoming.

But it is to be hoped that Mr. Cash will be present to explain his alterations and the necessity for them, as they are a revelation to the unfortunate shareholders of what a mistaken policy has been persisted in, in spending the enormously disproportionate amount that has been spent on obtaining the paltry consumption got from coin-meter installations, for stoves, fittings, meters, services, and mains.

These last two must not be omitted, because for more than ten years past there has been no development in the sale of gas in any other way, and therefore the whole capital expenditure must, I say, be debited to this branch of business alone, besides the large writing-down annually, and money otherwise contributed from revenue. It will be seen that by far the greatest part of the excess revenue expenditure for years past has been on distribution; and Mr. Dickens's questions were pertinent enough in contrasting the Belfast gas undertaking expenditure with the Dublin Company's. Leaving out depreciation, which, of course, in a municipal concern is otherwise provided for, the Belfast undertaking carries on a much larger business in ordinary and coin-meter supplies, at a figure *in toto* of only some £11,877 per half year, or 2·42d. per 1000 cubic feet, against the Dublin figures of £21,734 at June, 1913, equalling 7·49d. per 1000 cubic feet of acknowledged expenditure, *plus* some £7000 to £8000 (another 2½d. per 1000 feet) which Mr. Cash's account for 1914 shows to have been heretofore appropriated without acknowledgment—making 10d. in Dublin, against 2·42d. for Belfast, apart from depreciation.

Here let me say that the form of accounts issued by the Belfast Corporation is, for exactitude in detail and principle, and in clearness of expression and frankness, beyond all praise. I have begged the compiler of "Field's Analysis" to get permission to give us this useful account of an Irish Corporation in the comparative form. Had the shareholders—aye, even the Directors, to say nothing of the unfortunate writer of these notes—had these figures stated in "Field" against even the distorted version that was furnished to "Field" by Dublin, many mistakes would have been saved, and not the least to me personally that I should, with the full knowledge of the real facts, never have advised (as I too often did) that the Dublin investment was worth considering.

Mr. Edwards must see by the new figures how misled we have all been by the loose and inaccurate shape of the old statements, by their serious suppression of large amounts of income, and their expenditure unsanctioned by the shareholders.

Those responsible should acknowledge their incapacity, and retire from the administration; and if they do not, we shareholders should seek a legal remedy for their tampering with the figures, which under recent legislation is a matter of liability to penalty. However, we are getting the truth. Dublin is not a rich field as it stands, with this millstone round its neck.

Palace Chambers, Westminster, Sept. 26, 1914. Hy. E. Jones.

Tar Prices and the War.

SIR,—The letter from your correspondent quoted in a foot-note to your last price-list of tar products in the provinces is interesting, and his proposal to give the value of the total liquid products of a ton of tar is very commendable.

Your correspondent, in addition, puts very ably the pitiful case for the tar-distiller; but one wonders why the gas industry should be expected to finance the "Tar Ring." Was it not to enable bankers to finance genuine industries that the moratorium was declared and the issue of treasury notes made?

Perhaps, however, it was intended to imply that the tar industry has a claim upon that of gas by reason of its generous dealing in the past. On the other hand, it is possible to regard this latest proposal as merely the continuation of a policy that, to say the least, is not followed in the interest of the gas industry.

What price is the stock of pitch which will have accumulated in the hands of tar distillers, and will be marketed by them, likely to fetch at the end of the war should it last the three years contemplated by Lord Kitchener? And would it not be advisable for the tar suppliers to have a lien on the goods?

There might be something to be said for the proposal if a minimum price to be ultimately paid for the pitch were agreed upon, and half the minimum paid monthly along with the value of the liquid products, and payment for the balance deferred. Both industries would then bear their share of the cost of financing the business. Surely, a fairer proposition.

It appears probable, however, that the financial position of the gas industry will be quite as prejudicially affected by a protracted war as that of the tar industry, and it might be well for those interested in the former to consider whether, if it is really necessary for them to finance the latter at all, it might not be worth while to take the bull by the horns, and do it thoroughly, on their own account.

EQUITY.

Sept. 23, 1914.

SIR,—Referring to the tar quotations in the "JOURNAL," our contract for tar is based upon the maximum prices quoted; and we should like to know the value at which you estimate the tar to be worth for sale purposes. We understand, of course, that if the prices recorded are charged by us to our contractors, there is an end to the matter, as in our case there is no question of a "deferred value" being added afterwards.

In the current issue of the "JOURNAL" we do not quite understand what you mean by "liquid products contained in one ton of tar," as you commence the values by again using the word "tar." Does this mean the total value of the tar as sold from the works to the distiller, or is it tar with certain of its constituents left out, which you value at 15s. 9d. to 17s. 3d. per ton?

In your foot-note, under tar values, you state that the pitch, which forms about five-eighths of a ton of tar, is not included in the value. But we cannot quite reconcile this to the prices you quote, as taking the maximum value—viz., 17s. 3d.—as a basis for liquid products only, the value per ton with the pitch would be 46s., which is considerably in excess of the values recorded immediately before the outbreak of war.

GENERAL MANAGER.

Sept. 23, 1914.

SIR,—With reference to your quotation of 15s. 9d. to 17s. 3d. as representing the liquid products contained in one ton of tar, might I ask you to make it clear whether the whole of the cost of distillation has been charged against the value, or whether it has been apportioned between liquid products and pitch. The proposal in Yorkshire is to place the whole cost of distillation against the value of the liquid products.

E. H. HUDSON, Secretary and Manager,
Normanton Gas Company.

Sept. 24, 1914.

[Regarding the above letters, the reporter of "Current Prices of Gas Products," whose letter was summarized in the "JOURNAL" last week, p. 680, writes: "The remarks of your second correspondent are quite right. In giving the value of the liquid products contained in a ton of tar, I have assessed that portion of the tar which roughly represents three-eighths of the working expenses, carriage, and profit; and when I give you a price for the five-eighths of a ton of tar represented by the pitch, from this I have to deduct five-eighths of the working expenses, carriage, and profit on a ton of tar."—ED. J.G.L.]

Government Proposals to Avoid Unemployment.

SIR,—The steps that have been taken by the Government, and the intimation issued by the President of the Local Government Board (who has reminded the Association of Municipal Authorities that it is the duty of every municipality to prepare schemes for the relief of unemployment, to be put into execution so soon as distress becomes acute), appeals to the gas industry no less than any other.

In fact, the prosperity of the gas industry will depend during the period of the war upon the prosperity of all other industries in the country; and, if it can be shown that the gas industry in its several units can, with advantage to itself, anticipate the execution of works which may be wanted in the near future, and further put in hand now the reconstruction of old plant upon modern lines, it will be serving a double purpose of considerable advantage to the community at large, and result in economical advantages to itself when the works are completed.

While great strides have been made in the gas industry by the introduction of modern plant which has resulted in general economy, it is not going beyond the facts to say that there are very many works which are still largely—if not wholly—dependent upon a type of plant yielding from the materials employed from 15 to 20 per cent. inferior results than more modern plant would do, and involving expenditure on labour in a far greater proportion.

These conditions alone warrant expenditure at any time, as in the majority of cases it could be shown that the economies resulting will be more than sufficient to pay interest and sinking-fund charges on the contemplated capital outlay. And, while I am aware that my proposal has to some extent for its object the economy of labour, I need hardly point out that the economy will not become effective until after the stress of the war has passed, when—it is clear to all who look ahead—a trade boom will arise in this country such as has never been experienced before.

The Government departments have been careful to emphasize the necessity of the work contemplated being of a permanent character and not in the nature of so-called "relief work," where money is uselessly spent.

They offer certain financial facilities for aiding in the execution of such works—provided they are satisfied as to the wisdom of the expenditure; and, while doubtless the gas industry is not likely to put forward any wild or ill-considered schemes, it does seem to me to be an opportunity to take in hand the reconstruction of works which are scientifically and economically unsound.

That any schemes taken in hand will require the mature and careful consideration of responsible parties is a reason for ventilating this subject while there is yet little stress of unemployment in the country. A thorough scheme of reconstruction requires looking at broadly, and its full effect upon the undertaking as a whole carefully weighing up, unless money is to be spent uselessly. The present period of comparative repose may, therefore, be profitably employed in carefully considering and, if necessary, maturing schemes, so that their execution may be put into effect as and when the time demands.

W. R. HERRING.

Palace Chambers, Westminster, Sept. 24, 1914.

National Gas Exhibition.

SIR,—With reference to the first list of responses received to the appeal for contributions towards the deficit in the accounts of the National Gas Exhibition, I regret to say that the name of the Corporation of Stafford, who kindly contributed £10, was inadvertently omitted. The amount was received before the appeal was actually issued.

Will you be so good as to insert this communication in your next issue, in order that the omission may be rectified?

Institution of Gas Engineers,
39, Victoria Street, S.W.,
Sept. 23, 1914.

WALTER T. DUNN, Hon. Secretary.

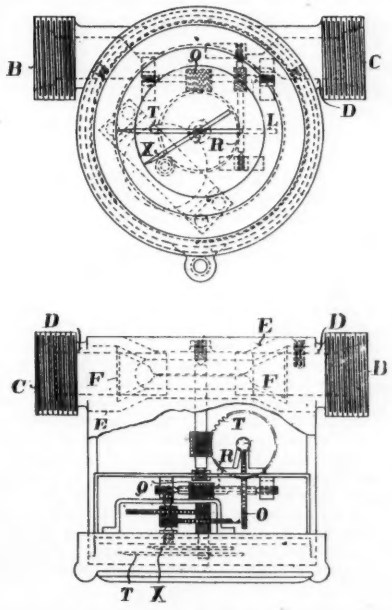
REGISTER OF PATENTS.

Gas-Meters.

RASCH, L., of Horseferry Road, Westminster.

No. 21,375; Sept. 22, 1913.

This invention relates to meters in which a gas-driven wheel drives hands to indicate upon a dial the value of gas consumed. The fan for this purpose is so disposed in the gas-passage that the power of the gas in flowing past it is utilized to practically its full extent in causing a rotary motion to the fan. For this purpose, the line of passage of the gas is tangential to the periphery of the paddle, and the passage is disposed above the axis of the wheel—the cross section of the passage being substantially coterminous with the area of the vanes of the wheel.



Rasch's Gas-Fire Meter.

An elevation of a meter, and a plan (with the outer case broken away) will show the mechanism.

The meter is provided with an inlet B and outlet C for the gas, both in communication with ducts D with a chamber E which follows closely the contour of a fan F, the blades of which are shaped to fit the casing closely without touching. The ducts D are so placed that the gas

flowing through the meter impinges upon the peripheral blades of the fan. The axle carrying the fan also carries a worm which interacts with a worm wheel L on a spindle bearing a worm which operates with a worm wheel O borne on an axle carrying a worm G. This worm actuates a worm wheel R, which is fast on an arbor to which is frictionally secured the pence-hand T. A train of reducing gears operates a shillings hand X; the hands travelling round a graduated enclosed dial.

In operation, the gas, on entering, impinges upon the vanes of the fan F, and in passing out is bound to traverse the chamber E and so compels the fan to turn and cause the value of the gas which has passed through the meter to be indicated. To reset the hands the dial is uncovered; and the hands, being only in frictional contact with their arbors, may be moved round to zero without disturbing the mechanism The invention therefore is said to be particularly useful in connection with gas-fires where a charge is made for the use of the fire.

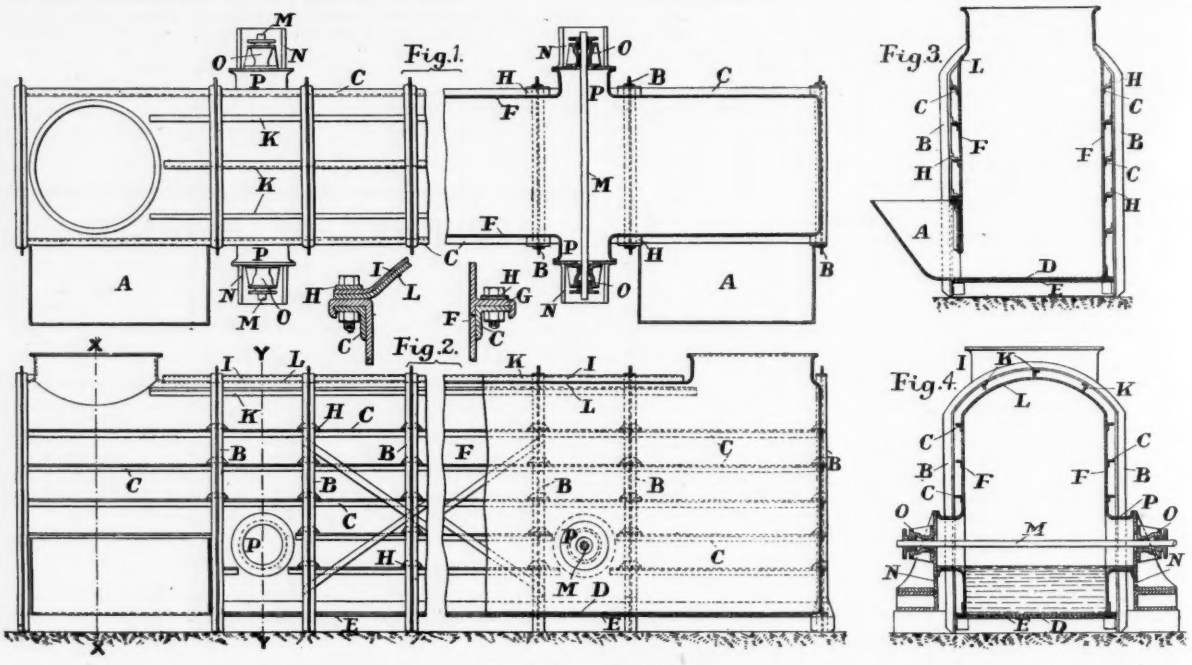
Absorbing Ammonia from Producer Gas.

MOND, E. S., of Victoria Street, S.W.

No. 17,779; Aug. 2, 1913.

The patentee notes that there is considerable difficulty in constructing a lead-lined washer for absorbing ammonia from producer gas of the type in which dashers or beaters revolve within a long casing or vessel containing acid liquid (acid solution of ammonium sulphate) and spray the liquid into the gas passing through the casing. His invention relates to improvements in this class of apparatus whereby the shell of the vessel is wholly of lead sheet duly supported, and generally to the construction of the washer as a whole.

Fig. 1 shows the washer in sectional plan; fig. 2 is a sectional elevation; figs. 3 and 4 are cross sections on the lines X and Y.



Mond's Ammonia Washer.

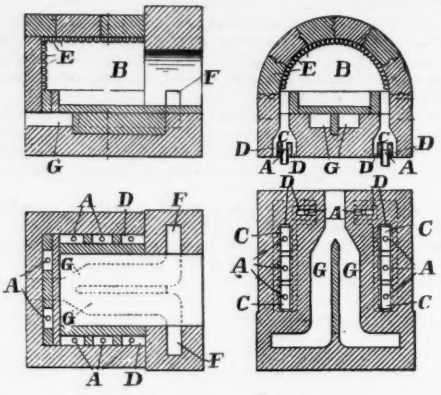
The washer is a long vessel provided with two or more lutes A for the removal of tar. It comprises a framework of steel made up of a number of vertical members B connected by horizontal members C. The floor of the vessel consists of sheets of lead D laid on steel plates E; the edges of the sheets being autogenously soldered to the sides of the vessel which are sheets of lead F supported by the steel framework. For this purpose lead straps G are burnt on to the sheets, and are lapped over the horizontal members of the frame, where they may be held by metal bars H bolted to the members so as to grip the lead strips throughout the length of the sides of the vessel. The arched steel roof members I are connected by longitudinal members K, over which are lapped lead strips burnt to the curved lead sheet L as in the case of the sides. The upper edge of the lead sheet constituting the side of the vessel is lapped over the uppermost horizontal side member of the frame, and is clamped together with the edge of the roofing sheet L between the member I and the uppermost horizontal member C. The dashers [not shown] are carried on shafts M, the bearings of which are supported on foundations separate from the framework. The bearing is carried by a heavy cast-iron vertical plate N; and integral with it is a stuffing-box O, through which the shaft extends. A lead tube P is burnt on to the side of the vessel, and its flanged mouth is bolted to the face of the plate N, which is covered with lead.

Furnaces for the Heat Treatment of Metals by Gas.

RUSSELL, W. A., and LORD, J., of Manchester.

No. 3339; Feb. 9, 1914.

In the application of this invention to a furnace heated by gas, the patentees arrange the burners A so that they project the flame directly into the heating chamber B; the burners being protected from the radiant heat of the adjacent incandescent surfaces by refractory material C. The air for combustion is supplied (where the burners are of the bunsen type) partly through the burners and partly around the burner orifices at D. The flame and products of combustion issuing into the chamber B adjacent to the walls of it and at each springer or



Russell and Lord's Gas-Heated Furnaces.

base are caused to impinge upon the surface of the walls, which, being roughened or provided with projecting ridges E, breaks up the hot gases and so come into intimate contact with them. The walls are then raised to, and maintained at, an incandescent heat. The chamber roof is preferably of semi-circular form; so that the flame and gases rising from the burners are gradually deflected by the roughened surface from a vertical to a horizontal direction prior to leaving the chamber through outlets F. The waste gases are passed through the brickwork from front to back, so as to assist in the heating of the latter and economizing fuel. The waste heat from the heating chamber may be passed beneath the chamber floor through the passage G. By this arrangement it is claimed that it is possible "to obtain efficient results, with economy of fuel, and without the necessity for the destructively high temperatures at present required in combustion chambers."

Retort for the Distillation of Carbonaceous Materials

TOZER, C. W., of Victoria Street, Westminster.

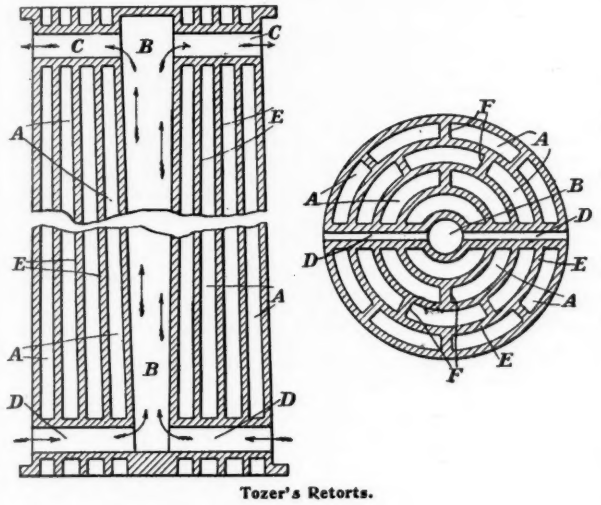
No. 7116; March 20, 1914.

This invention relates to retorts constructed with a ring of chambers around a central axis, each chamber being of approximately the same size, as previously patented in 1909 (No. 20,158).

Retorts of the class mentioned are, the patentee remarks, principally used in gas-works, smokeless fuel works, &c., where coal, shale, or other carbonaceous substances are treated under atmospheric pressure, in a vacuum or partial vacuum, at either a low or high temperature—between the limits of 300° to 1200° C., "such retorts being capable of being used in either a vertical, oblique, or horizontal position, and can be made of various metals, refractory materials, and substances."

According to the present invention, the retort is made with two or more rings of spaces, concentrically or eccentrically arranged with regard to each other and about a common axis; the spaces being formed from a number of ribs and walls, all of approximately the same cross sectional area, so as to permit the carbonization of "a larger quantity of the material than hitherto with absolute uniformity."

Hitherto, the patentee proceeds, it has not been possible to carbonize or distil coal or other carbonaceous material in large quantities, to produce a coke or fuel uniform in character, excepting at a very high temperature, and a long time period for carbonizing; and when it is attempted to carbonize at a comparatively low temperature, the fuel is not uniform in character, and there is a large percentage of breeze or fines, owing to the outer layer being carbonized or over-carbonized and the inner portion being soft or only partially carbonized—that is to say, the percentages of volatile matter increases from a minimum at the outer portion to a maximum at the inner portion or centre. This variation is very detrimental to the success of a smokeless fuel; but it is claimed that the present improvement "not only produces a fuel absolutely uniform in character, but it carbonizes the charge in a remarkably short period of time—thus showing the enormous advantage of a retort of this description." One retort with twelve sections having combined a cross sectional area available for carbonization equivalent to a plain tube 25 inches in diameter, and capable of holding about ½ ton of coal, is said to carbonize that quantity in one-twentieth the time necessary when using the ordinary plain tube retort of equivalent diameter.



Tozer's Retorts.

A longitudinal sectional elevation and a section are shown of a retort constructed with twenty spaces A and a central passage B for heating gases; the central passage being connected near its top and bottom by passages C D leading from outside the retort.

The spaces A may be concentrically or eccentrically arranged around the gases passage B, and each space A in the retort is of the same superficial area in cross section—that is to say, each space will contain the same amount of material to be carbonized, "so that the heat of the furnace acts uniformly on all the material in each space, and not to a greater extent upon one, as would be the case if the spaces were not of the same capacity."

The spaces A are formed by walls E and radial ribs F, both walls and ribs being tapered or angled so that the spaces which reach from one end of the retort to the other are tapered with the larger part at one end of the retort. Thus "easy charging and discharging of the retort can take place."

Doors are provided at the ends of each retort, so that the contents can be treated under atmospheric or other pressure, or in a vacuum or partial vacuum, and the process can be carried out continuously or intermittently.

Some of the ribs—preferably the two which run from the centre to the outside of the retort in the same plane—may be provided with a passage way C D, at top and bottom, so as to admit the heating gases from the furnace to the central passage B. In such case "the heating of the contents of the retort is greatly assisted—in fact, the time of heating the contents of a retort as shown can, it is said, be done in one-thirtieth the time required to heat the same quantity of material in a plain tubular retort having the same capacity."

Gas-Tap for Geysers.

WINTERFLOOD, J., of Finsbury Park, N.

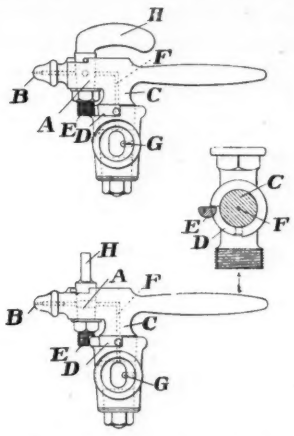
No. 12,840; May 25, 1914.

This gas-tap (to be principally employed for use with geysers and like water-heaters) has the pilot-light burner formed as part of the gas-plug or as an extension, and has to be turned on before the gas-tap can be operated to supply the gas to the burner proper.

The illustration shows a side elevation of the gas-tap and pilot-light tap, both being turned off, a similar view with the pilot-light tap turned on, and a section of the tap in the turned-off position.

The invention consists in positioning the pilot-light tap A and burner jet B on an extension of the gas-tap plug C and elongating the plug of the pilot-light tap in proximity to the cut-away portion or knighting D of the gas-tap casing in which the pin of the gas-tap rides to limit its movement. A portion of the end E is cut-away so that when the pilot plug is turned on the extension of the pilot-light plug is free of the edge of the gas-tap casing, and allows the gas-plug to be turned by the handle, and with it the pilot-light tap; but when the gas-plug is closed and the pilot-light tap turned off, the reduced end of the extension is projected into the cut-away portion of the gas-tap casing, and prevents the gas-plug being turned by reason of the extension of the pilot-light plug having action against the end wall of the cut-away portion of the gas-plug casing.

The gas is supplied to the pilot-light tap by a hole F leading from the top of the passage in the gas-plug and extending at right angles through the pilot-light tap to the burner, as shown in dotted lines; and there is also provided a branch hole G in the plug for the passage of gas to the pilot-light tap when the plug C is shut off, so that the pilot-light can be turned on and lighted before the gas-plug is turned on.



Winterflood's Gas Geyser Tap.

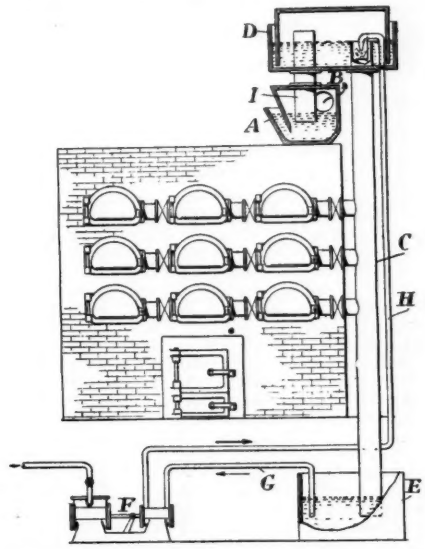
As will be understood, the pilot-tap and the gas-plug move together; so that the pilot-light may be projected over the burner proper to light it when the plug is turned to supply the burner, and when the plug C is turned off the pilot-light can be extinguished by turning the handle H of the pilot-light plug.

Manufacture of Coal Gas.

CONGDON, R. C., of Atlanta, Georgia, U.S.A.

No. 9587; April 17, 1914. Convention date, April 29, 1913.

In the illustration given (in elevation, partly in section) of one form of apparatus according to this invention, a bench of coal-gas retorts is fitted with a hydraulic main A having an off-take B, a stand-pipe C, and a tank D having a bell with which the stand-pipe connects and so arranged that the fluid in it may be made to overflow down the stand-pipe. This equipment performs the function of a bridge-pipe and connects the stand-pipe with the hydraulic main. At the lower end of the stand-pipe is a seal-pot E. The pump F serves to withdraw fluid from the seal-pot by the pipe G and deliver it by the pipe H inside the stand-pipe. The pipe H is provided with a nozzle and spray device arranged to discharge into the extreme upper end of the stand-pipe.



Congdon's Gas Manufacture and Purification Plant.

The three retorts in each row are connected by valves with each other and with the stand-pipe. In use, fluid is circulated through the stand-pipe, but does not pass into the retorts. The fluid thus circulating (preferably in the form of a spray or shower) not only keeps the stand-pipe clean, but also scrubs and cools the gas in its passage through the pipe on its way through the tank D and drip-pipe I to the hydraulic main. "This scrubbing and cooling of the gas in the stand-pipe relieves the rest of the apparatus [not shown] from a considerable part of its work; thus increasing the capacity of the plant and reducing the first cost of installation."

Sale of Littlehampton Gas Shares.—Messrs. Sparks and Son sold locally last Wednesday 800 £5 "C" shares in the Littlehampton Gas Company; the issue being made to provide fresh capital, with the view to carrying out extensions. The prices realized ranged from £5 5s. to £5 8s. per share.

LEGAL INTELLIGENCE.

GAS COMPANIES AND THE REPAIR OF ROADS.

The two actions of the Gas Light and Coke Company *v.* Woodford Urban District Council and Wanstead Urban District Council, which were before the Court last week [as reported in the "JOURNAL," p. 674], again came before Mr. Justice SANKEY (Vacation Judge) on Wednesday last.

Mr. DIGHTON POLLOCK said he appeared for the plaintiffs, who sought an injunction restraining the two Urban District Councils from repairing certain roads in their districts with reinforced concrete. But as the evidence was not complete, he had to ask for a further adjournment, and that the undertaking already given should be continued.

Mr. NALDRETT (for the defendants) said he had no objection to the cases standing over for a week, subject to one provision. The plaintiffs sought to restrain the execution of work proceeding in certain thoroughfares through which there was a great deal of traffic. With regard to roads in which work had not yet commenced, the defendants had no difficulty in giving an undertaking not to begin; but where work had been commenced, it was most important that it should be proceeded with. Therefore the undertaking would be without prejudice to defendants' right to proceed with work already commenced, so that traffic should not be impeded. He was willing to give an assurance that defendants would not start any fresh work.

His LORDSHIP thought this offer should be accepted.

Mr. POLLOCK said his clients wished to act reasonably, and would accede to the application, though, of course, it would be without prejudice to their rights. The repair of roads with reinforced concrete was a new thing, and plaintiffs had no experience of it; and as they only wished to do what was proper in the protection of their statutory rights, he suggested that they should take a piece of the concrete which had got to its maximum pitch of hardness and experiment upon it in the presence of witnesses on both sides. If the plaintiffs were satisfied that the hardness of the concrete did not exceed the hardness of concrete as usually used, or add to the difficulty in breaking-up, they would discontinue the action.

Mr. NALDRETT observed that this was not the question in issue. His short answer was that the local authority had statutory powers to make-up the roads as they thought fit, and when this power was exercised in a *bonâ fide* manner the Court would not interfere.

His LORDSHIP: You do not want to walk into his parlour.

Mr. NALDRETT: I do not.

His LORDSHIP: Then it is a matter which you must arrange yourselves.

Mr. POLLOCK: If the defendants will agree to what I propose, it may put an end to the case; but if they do not, I think we should take a longer adjournment than a week, so as to complete the evidence.

Mr. NALDRETT thought a week's adjournment would be sufficient.

His LORDSHIP ordered the case to stand over for a week, and suggested that, in the meantime, the proposal which had been made might be considered.

WATER CHARGES TO LICENSED VICTUALLERS.

Before the Brighton Bench, last Wednesday, Mr. D. C. Clark, of the New Ship Hotel, was summoned in respect of the non-payment of £88 15s., poor and district, library, and water rates. Mr. Buckwell (for defendant) said that the Brighton and County Licensed Victuallers' Protection Society were fighting the question of water-rates as a matter of principle. For many years past the Water Committee of the Brighton Town Council, in excess of their rights, had demanded from all public houses in the Borough a water-rate of 1s. in the pound per annum, instead of 9d., on the ground that the water was used for their trade or business. The Deputy Town Clerk (Mr. Jeffreys) remarked that the extra 3d. in the pound was in respect of an outside tap. It had been argued that, under the decision in the case of the *Metropolitan Water Board v. Avery*,* the use of water for washing-down pavements was for domestic purposes; but the Corporation contended that it was a non-domestic use, and that therefore they were entitled to make this extra charge. In order, however, to have the matter thrashed out, the Corporation desired to be represented by Counsel; and so that this might be done, he asked for an adjournment. The Magistrates agreed to this course, on the understanding that the cost incurred would be borne by the Corporation; and it was arranged that the further hearing should take place on the 28th prox.

* See "JOURNAL," Vol. CXXIV., pp. 608, 891.

Darkened London.—Last week the "Daily Chronicle," referring to the darkened condition of London streets at night, wrote: "If it is the Germans who are now making London dark, let us not forget that it was a German who first made it light. His name was Frederick Albert Winsor; his profession a company promoting expert. The company that he promoted he styled the 'New Patriotic Imperial and National Light and Heat Company,' and the profits that he estimated proved him of the true Imperial breed. To the shareholders he promised 1100 per cent., to the Government the extinction of the National Debt, to the public London's night equal to London's day, and to those with the 'will-to-believe' a revenue of £229,000,000 a year. It was just a century ago that the object was achieved; for in the year 1814 both Pall Mall and Westminster Bridge were lighted with gas-lamps. So that Frederick Albert Winsor did not use all his gas to inflate his prospectus."

MISCELLANEOUS NEWS.

BRITISH GAS LIGHT COMPANY, LIMITED.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Sir CORBET WOODALL, D.Sc., in the chair.

The SECRETARY (Mr. A. W. Brookes) read the notice convening the meeting and the Directors' report, together with (in compliance with the Act of Parliament) the financial statement referring to the Norwich station. The report was as follows:

The Directors submit the half-yearly accounts of the Company to June 30 last, as examined and certified by the Auditors, who have also vouched for the correctness of the investments held by the Company.

The available profit is £33,567, after deducting (omitting shillings and pence) the following sums: Income-tax, £2246; Hull debenture interest, £2109; Norwich debenture interest, £1772; Potteries debenture interest, £656; Trowbridge debenture interest, £164; interest on debenture stock, £2250—total, £9199.

HULL.—The gas-rental shows an increase of £769, as compared with the corresponding period of 1913, the price of gas having been the same—viz., 1s. 10d. per 1000 cubic feet. Coke shows a decrease of £3869; tar and tar distilling, a decrease of £1217; and ammoniacal liquor and sulphate of ammonia, a decrease of £1517. Coals have cost 15s. 10d. per ton, as against 13s. 5d. Coke has realized 11s. 5d. per ton, as against 13s. 11d. The gas sold shows an increase of 7,980,987 cubic feet—equal to 1·03 per cent. The quantity supplied in bulk to the Corporation for the supply of the Old Town was 42,834,000 cubic feet; being 2,540,000 cubic feet less than in the same period of 1913. The profit realized is £5448 less than the parliamentary interest. This sum will be taken from the reserve fund; leaving £26,065 to the credit of that account.

NORWICH.—The gas-rental shows a decrease of £439, as compared with that of the corresponding period of 1913; the price of gas having been the same—viz., 2s. 10d. per 1000 cubic feet with reductions for gas used for manufacturing and other special purposes. Coke shows an increase of £191, and tar, tar distilling, and ammoniacal liquor a decrease of £322. Coals have cost 19s. 1d. per ton, as against 16s. 3d. Coke has realized 17s. 9d. per ton, as against 16s. 11d. The gas sold shows an increase of 4,023,870 cubic feet, equal to 1·49 per cent. The profit realized is £4350 in excess of the parliamentary interest.

POTTERIES.—The gas-rental shows an increase of £467, as compared with that of the corresponding period of 1913; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet, with a rebate of 3d. for prompt payment. Special discounts to large consumers and to consumers of gas for power purposes are also allowed. Coke shows a decrease of £75; tar, an increase of £29; and ammoniacal liquor and sulphate of ammonia, a decrease of £698. Coals have cost 13s. 10d. per ton, as against 12s. 3d. Coke has realized 11s. 1d., as against 10s. 5d. The gas sold shows an increase of 3,870,947 cubic feet—equal to 1·88 per cent. The profit realized, after writing-off the sum of £1597 for demolished plant, is £2212 less than the parliamentary interest.

TROWBRIDGE.—The gas-rental shows an increase of £144, as compared with that of the corresponding period of 1913; the price of gas having been the same—viz., 3s. per 1000 cubic feet, with discounts. Residual products show a decrease of £30. Coals have cost 18s. 6d. per ton, as against 17s. 9d. Coke has realized 12s. 11d. per ton, as against 13s. 6d. The gas sold shows an increase of 955,200 cubic feet—equal to 2·85 per cent. The profit realized is £592 less than the parliamentary interest.

HOLYWELL.—The net gas-rental is the same as for the corresponding period of 1913, notwithstanding a reduction in the price of gas. The profit realized is £361.

PROFIT.—The available profit added to the previous balance of profit and loss amounts to £105,831 17s. 5d. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, with a bonus of 5s. per share, both less income-tax. The dividend and bonus will amount to £31,127 3s., and leave a balance of £74,704 14s. 5d.

RETIRING DIRECTORS AND AUDITORS.—The Directors who retire by rotation are Mr. Harold G. Palmer and Mr. Frederick Wilkin; and the Auditors are Mr. E. Knowles Corrie and Mr. William Cash, F.C.A. They respectively offer themselves for re-election.

THE LATE MR. J. HORSLEY PALMER.

The CHAIRMAN, in moving the adoption of the report and accounts, said when the proprietors last met the chair was occupied by Mr. Horsley Palmer. Shortly after the meeting, his health (which had been unsatisfactory for some time) seriously failed; and in June he tendered his resignation, which was regretfully accepted. In July he died. He would be remembered long and gratefully here, because of the services he rendered the Company during the 33 years he sat at the Board. The respect in which he was held by his colleagues was marked by their election and re-election of him as their Chairman through an unbroken period of 23 years.

THE WAR, AND THE HALF-YEAR'S RESULTS.

The terrible war which was devastating Europe affected, at the same time, the interests of practically every citizen of the British Empire. The commercial relations of the United Kingdom with the other nations of the world were so intimate and varied that, when one suffered, this country almost inevitably suffered also. The British Gas Light Company could not hope to escape sharing the general visitation. The increased cost of freight due to insurance against war risks had tended to neutralize the gain from the reduction in the price of coal. The markets for certain of the secondary products of carbonization had been contracted or closed; and missed were some of the articles made in Germany which they had allowed to become necessary to their own finished manufactures. Further, the interference with trade generally must lead to unemployment, and consequently to a limitation of the demand for gas. In face of these actual and potential causes of loss and trouble, it was gratifying that the Directors could again place before the proprietors a satisfactory statement of the half-year's working. It was true that, as a Company, they had not earned the full dividend and bonus; that the Directors proposed to scatter more than had been gathered. An examination of the accounts would, however,

show that at present the Board could hardly be accused of rashness to any grave degree.

THE WORKING AND RESULTS REVIEWED.

At the Hull Station there was a deficiency of £5448; and at Christmas last they were behindhand at that station to the extent of £7686—together, £13,134 in twelve months. Looking back over three years, the net deficiency had been nearly £20,000; but in that period the Company had been engaged in very extensive works of reconstruction, the cost of which (£21,000) had been charged against revenue. Had the years been normal in respect of repairs and renewals, the station would have paid its way. It would no doubt be borne in mind by the shareholders that a considerable reserve fund had been accumulated by Hull expressly to meet such special expenses; and of this reserve £26,000 would remain after providing for the past half year. Transferring, then, the £5448 from the Hull reserve to the profit and loss account, they had available £33,567. The dividend and bonus proposed would require £31,127; and there was left £2440 to be added to the general balance carried forward. The price at Hull was very low—only 1s. 10d. per 1000 cubic feet. The profit earned at Norwich was quite satisfactory; being £4350 more than the parliamentary interest allowed. The profits in past years having been considerably less than the authorized amounts, this surplus became a divisible profit, and reduced the sum of outstanding deficiencies. At the Potteries, although the newly-appointed Engineer (Mr. Harold E. Copp) only took up his duties on April 15, it was felt thus early that the conduct of the station had been placed in very competent hands. The profit realized was £2212 less than the parliamentary interest; but, during the half year, there was an exceptional charge against revenue of £1600, which included the balance of the amount to be written off for certain plant demolished, or put out of use when the new works at Etruria were erected some few years ago. He might mention that, at each of the three larger stations (Hull, Norwich, and the Potteries) the Company had now practically new works—new works constructed on such very admirable lines that they would involve, in the way of special expenditure such as he was now referring to, a very small amount in the years immediately following this. Reverting to the Potteries station, although the quantity of coal carbonized was 157 tons less, as compared with the half year to June, 1913, the cost amounted to £1500 more. It was satisfactory to note that, while a less quantity of coals was carbonized, the sales of gas were higher by nearly 4 million cubic feet. Without going into details as to the other stations, he could say that the results given in the report reflected credit upon the management.

PRICE OF COAL.

Coal for the year commencing on July 1 last had been purchased at prices showing a reduction of 1s. per ton. Although this was satisfactory, the falling-away of the market value of coke more than outweighed it. Vigorous efforts were being made to bring more clearly before the public the merits of coke as a fuel.

THE NEW ACT OF PARLIAMENT FOR HULL.

The Act of Parliament for Hull promoted by the Company in the last session received the Royal Assent on April 30. The Act authorized the expenditure of a further capital sum of £300,000 at this station. A pleasing circumstance in connection with the Act was that it was unopposed by the Corporation of Hull, whose representatives, when meeting the Directors, made references to the Company's administration of affairs in Hull, which were complimentary in the highest degree.

A COKE HEAP FIRE—VERTICAL RETORT EXTENSION.

Accompanied by Mr. Harold G. Palmer, the new Director, he (the Chairman) had recently visited the Hull and Norwich stations, and found them in a condition of which the Company might be proud. At Hull there had recently been a considerable loss of coke due to a fire which had developed in the midst of a large store heap. This was extinguished without causing any personal injury, and very little damage to plant. The money loss would probably reach some £1500. At this station, a considerable installation of vertical retorts was erected some two years ago. The initial trial gave results so satisfactory that a further and larger section was being built; and it was hoped that a portion at least of this would be in use in the coming winter.

ABNORMAL TIMES AND DEMANDS—MEETING THE DAY NEEDS.

In view of the few figures and facts he had given, the payment of a full dividend was, he thought, fully justified. That this was so would be specially welcome to many of the shareholders. The present was a time of unusual and heavy demand on personal service of all kinds, financial included—demands which were being nobly met. At the same time, income was not being maintained, and in some directions had practically ceased. This, then, in the opinion of the Directors, was not a season for accumulating larger reserves, but rather for aiding, to a prudent limit, in meeting the needs of the day. Opinions greatly differed as to the probable duration of the war. For himself, he could not think that it would be greatly prolonged, or, if it unfortunately should so happen, that, as a nation or an industry, they would suffer severely. Words were powerless to express the grief which all felt for those who were the direct victims of the war, or of the horrible methods by which it was being prosecuted. But its influence on the commercial life of the country might be less than was feared by many. The withdrawal of so many men from productive work was a grave matter, but not necessarily a disaster. Those who were left would, judging by his experience, do all in their power to make up for the loss; and, with the freedom of the seas secured, the country's exports and imports should be, in a large measure, maintained. Britishers were rapidly learning that many things hitherto brought from Central Europe, could be made quite well at home; and even when the war was over, the country would probably continue in these respects self-dependent. On these grounds, he recommended for adoption the resolution he had submitted.

Mr. FREDERICK WILKIN seconded the motion, which was unanimously carried.

DIVIDENDS AND RE-ELECTIONS.

Moved by the CHAIRMAN, and seconded by Major-General W. T. CORRIE, a dividend at the rate of 20s. per share and a bonus of 5s., both less income-tax, were declared.

Proposed by the CHAIRMAN, and seconded by Major-General CORRIE, Mr. Frederick Wilkin was re-elected to his seat at the Board.

The CHAIRMAN said he had peculiar pleasure in proposing that Mr. Harold G. Palmer be re-elected a Director. It would be foolish to disguise the fact that the Board were led largely to the choice of Mr. Palmer by the fact that he was his father's son; and it was a satisfaction to know that his election, when it took place, was a consolation to their late Chairman at a time when he specially needed it. But while this had weight with the Directors, they placed great weight upon the training Mr. Harold Palmer had had. He took his degree in engineering at Cambridge; and he had been occupied for some years in mechanical engineering work. He (Sir Corbet) could at least say, after the observation he had made, that their new Director's devotion to the Company's work, and his grasp of it, had been very satisfactory during the time he had had the pleasure of spending with him.

Mr. WILKIN seconded the motion.

Mr. HENRY PULLMAN congratulated the Board on the excellent choice they had made in filling the vacancy caused by the lamentable death of their late colleague.

The motion was heartily carried.

Proposed by Mr. KENNETH R. MACKAY, and seconded by Mr. PULLMAN, Mr. E. Knowles Corrie was reappointed an Auditor, as was also Mr. William Cash, F.C.A., on the motion of Mr. BERNARD F. HARRIS, seconded by Mr. J. CHAMBERLAIN.

VOTES OF THANKS—APPRECIATIONS OF THE LATE CHAIRMAN.

Mr. A. G. BURNEY, in moving a resolution of thanks to the Chairman and Directors, asked to be allowed to say that the full body of shareholders associated themselves with what had been said by Sir Corbet with regard to the late Mr. Palmer. They must all feel that he gave of his best to the service of the Company; and they all regretted his untimely removal from their midst.

Mr. PULLMAN, in seconding, said he had for many years been actively associated in the direction of three important gas concerns. He was therefore able to appreciate thoroughly the difficulties under which the Board had been labouring in these exceptional times. Very heartily he congratulated, and he was sure his fellow shareholders did the same, the Chairman and his colleagues upon the splendid results they had shown. To the Board it must be as satisfactory to present such accounts as it was to the shareholders to receive them.

The motion was cordially agreed to.

The CHAIRMAN, in responding on behalf of his colleagues and himself, said he could assure the shareholders that the members of the Board did miss Mr. Horsley Palmer very much indeed. While he (Sir Corbet) was not so young as he was, he, at any rate, could promise that, when he felt he was incapable of carrying on the duties of the office efficiently, he should not for long occupy the chair. He thanked them very sincerely for their kind appreciation of the services of the Board. Although he was going to ask Mr. Gardiner to propose a vote of thanks to the officers, staffs, and workmen, he should from the chair like to place on record how well pleased were the Board with the manner in which the Company were served by their officers.

Mr. R. S. GARDINER, in moving a vote of thanks to the Secretary, the Engineers at their stations, and to all who served the Company, remarked that it seemed that almost every year circumstances occasioned a further growth of the responsibilities and difficulties of all concerned in the management of gas undertakings. In their excellent Secretary, they had an official who was extremely conversant with the rather intricate details of the Company. This was rather an exceptional Company in regard to the way that the accounts of the different stations were kept. It required someone thoroughly acquainted with all the details of the Company's various Acts of Parliament to keep the accounts perfectly straight. They were, therefore, fortunate in having a Secretary who was exceptionally qualified to assist the Company in this direction. In the past half year, they had obtained an Act of Parliament in the passing of which their Secretary had been of valuable assistance. With regard to the stations, he was sorry the Chairman had not proposed the resolution, because it would have been more acceptable to the shareholders and to the officers to know from Sir Corbet how fully the Board realized that the difficulties and responsibilities of their officers had been added to, and that they found their officers so admirably ready to meet them. The present was a difficult time for all associated with gas undertakings. The questions of supplies and the disposal of products engaged the time of a gas manager to the full; but the Company were fortunate in having their works under the management of officers who responded loyally and well to the calls made upon them, and ably assisted the Directors—if, indeed, they were not the prime movers—in providing the excellent results recorded.

Mr. L. R. ABBEY-WILLIAMS seconded, and the motion was carried.

The SECRETARY, in responding on behalf of all included in the vote, said he knew the officers at the stations were all united in the endeavour to fulfil their duties and to merit the approval of the shareholders; and it would be a great pleasure to them to receive this recognition of their services. The references that had been made to the late Mr. Horsley Palmer had, he was sure, been highly appreciated by everyone present, as they would be by the shareholders who were absent, and who would, in due course, receive the report of the proceedings. But by no one had these references been more appreciated than they had been by himself, and would be by the officers at the stations, who all had a great admiration for the late Chairman and his administration of the affairs of the Company; nor would they ever be unmindful of the kindly interest which he took in every member of the staff of whatever rank. He (Mr. Brookes) felt that it was a cause for general congratulation that Sir Corbet Woodall had seen his way to accede to the unanimous wish of the Directors that he should accept the chairmanship of the Company. He was glad that, as soon as this was known, he (the Secretary) received letters from the Engineers expressing gratification, and their loyal devotion to Sir Corbet, to which sentiments he most respectfully and heartily subscribed.

METROPOLITAN GAS COMPANY OF MELBOURNE.

Seventy-Third Half-Yearly Meeting.

This Meeting was held on Tuesday, the 28th of July, at the Offices of the Company, in Melbourne—Mr. JOHN GRICE (Chairman of the Directors) presiding.

The MANAGER AND SECRETARY (Mr. John Hinde) read the notice convening the meeting, and the Directors' report and balance-sheet for the half year ended June 30 were taken as read.

The CHAIRMAN said: I have pleasure in submitting for your consideration and adoption the report of your Directors and the balance-sheet of the Company for the half year ended June 30 last.

HALF-YEAR'S OPERATIONS.

The figures contained in the balance-sheet are of a very satisfactory character. The output of gas for the half year shows an improvement; the sales being 1350 millions, against 1237 millions for the June half of 1913, which represents an increase of over 9 per cent. Our receipts from sales of gas amounted to £289,698, compared with £276,338 in the same period of 1913. The price, however, during the last half year was 4s. 4½d. per 1000 cubic feet, as against 4s. 7d. in 1913. The total returns from residuals were practically the same as in the corresponding half year—viz., £72,126, as compared with £72,055. It may not be out of place, however, to remind you that this source of revenue is a variable one; and we cannot rely upon always obtaining the same satisfactory proceeds. I say this more particularly now, in view of the fact that since our last meeting a severe set-back in prices ruling in the sulphate of ammonia market has taken place—due to largely increased productions of this commodity in Germany. Our returns in this direction will almost certainly suffer during the coming half year. The various items of expenditure in the revenue account do not call for special notice, except that we have again this half year included under the head of "repairs at works" a further provision of £10,000 for special renewals at the Company's works. We shall require to carry out very extensive renewal and repair operations (particularly at West Melbourne) in the coming summer; and we desire, as in the past, to spread the cost of these over a reasonable period, rather than to unduly burden some one particular half year. Our expenditure under the heading of coals has been added to during the half year on account of the cessation in the Maitland district, at Newcastle, of certain pits, including one from which we draw part of our supplies. This has necessitated the purchase by us of other coals at higher prices. The total number of meters standing fixed has risen to 135,937 (including 25,090 slots) at June 30 last, showing an increase of 8487 over the preceding June.

GAS APPLIANCES.

The business of our stoves and fittings department for the past half year is responsible for putting into use a large number of cooking and heating apparatus. Stoves in use have increased by 4400 during the half year. Sales of bath heaters show nearly 50 per cent. increase over the June half of last year—being 512, as against 348. Of gas-fires we have sold 1538 in the six months. This is a satisfactory return, and shows that the prejudice which undoubtedly existed at one time against the use of gas-fires is being replaced by a better understanding, and a proper appreciation of this hygienic and exceptionally convenient form of heating rooms. The greatest possible attention is being given nowadays by makers of gas-fires to securing the highest efficiency from the fires put upon the market, and, by the adoption of scientific methods, to prevent the pollution of the atmosphere by escaping fumes. During the last few months a series of tests of gas-fires have been made by the "Lancet," with highly satisfactory results to the gas industry; and the "Lancet," in concluding its remarks on the subject, says:

> "We believe the movement to bring gas methods of domestic heating into acceptance, from both a hygienic and economical point of view, is of considerable importance in the public interest, and we therefore support it.
>
> "Gas-stove makers can study the tests for themselves, and model the construction of gas-fires so as to pass certain requirements. If this is consistently done, and acted upon, no reproach against the radiant system of gas heating will remain."

You will probably have seen in a recent issue of our evening paper, an illustration of a house in one of the suburbs of Melbourne, of which the owner, by the complete adoption of gas fires and cookers, has entirely avoided the cost of the construction of chimneys; and we hope that this object lesson will be extensively followed in the future. We expect shortly to be in a position to introduce a new style of water-heating apparatus, automatically controlled, for kitchen and scullery use, which will be of immense benefit and assistance to those carrying on the domestic work of the household. The use of gas wash coppers has been well taken up, and we have a large number of orders on hand from builders, in addition to those already fixed and in use. It may be well to point out that, in the case of already existing fuel coppers, the heating of them by gas can be easily and cheaply provided for.

HIGH-PRESSURE LIGHTING.

The installation of high-pressure gas lighting in one of our leading draper's establishments is giving complete satisfaction; and we are now engaged in fitting up a second large installation in another similar establishment. In speaking of high-pressure lighting, I must refer to the fact that we have just recently concluded a contract with the St. Kilda Council for the lighting of the St. Kilda Esplanade and other main streets with high-pressure lamps. These will be of 1000 to 1500 candle power each, with several groups of 4500-candle power. This installation is to be completed by the early part of the summer, and will be on the same lines as those adopted by the Municipal authorities for the lighting of Victoria Street, Kingsway, Aldwych, and other leading thoroughfares in London; and we feel confident it will prove to be the best street lighting in the Metropolis.

ADDITIONAL CARBONIZING PLANT.

The additional eleven beds of Dessau vertical retorts for South Melbourne—a contract for which I informed you at our last July meeting had then been let—have since been completed and put into operation. We now have in all sixteen beds of Dessau vertical retorts at this station, and fifteen at West Melbourne. Still further provision has to be made to cope with next winter's demands; and after most careful consideration the Directors decided upon, and have placed a contract for, the erection of eight additional beds of vertical retorts at West Melbourne. In this case, however, we are adopting the Woodall-Duckham system of vertical retorts—similar to those just put down by a number of large gas undertakings in England; and this will enable us to make comparisons of the results to be obtained from the two different systems, and so act as a guide to us in respect to future extensions of our carbonizing plant.

NEW MAINS AND SERVICES.

Our reticulation system has been extended by the laying of 21½ miles of mains and 76 miles of services during the past half year, at a cost of £24,953. In addition, owing to the expansion of our business in the eastern suburbs, we have found it necessary to strengthen our supply in that direction; and we are now engaged in laying a high-pressure main from the Tooronga gasholder to afford the Camberwell district an improved and satisfactory supply. In order to provide an efficient supply in respect to the more outlying portions of several other suburbs, similar action will, in the immediate future, have to be taken.

HOLIDAY LEAVE TO EMPLOYEES.

The agreement arrived at last year before Mr. Justice Higgins in the Arbitration Court, provided for retort-house employees, who usually work on seven days in the week, being (after one year's service) granted ten successive days' leave of absence on nine days' full pay. During the past half year your Directors, as an experiment for one year, have granted six days' leave on full pay to all other daily-paid employees of the Company, which, we believe, the shareholders will approve. We trust that the result from a pecuniary point of view will be such as to justify a continuance of this privilege to the Company's employees.

HALF-YEAR'S FIGURES.

In disposing of profits for the half year, we have made the customary transfer of £26,000 to the reserve fund account, which, however, in the meanwhile, has been drawn upon for £34,087—this being £8087 in excess of that amount, thereby reducing the balance to credit of our reserve fund to £66,824. Then, £3000 has been passed to the credit of the meter renewal fund, and £3000 for depreciation of stoves, &c., account. The dividend recommended is at the same rate as last half year—viz., 6s. 6d. per share; representing 13 per cent. upon the share capital of the Company, and 8·42 per cent. upon the total subscribed by shareholders. The amount carried forward to next half year is £70,676. As connected with this moderately large carry-forward, it is only right to draw your attention to the capital account of the Company as it appears in the balance-sheet. You will see that it is merely what may be called a record of the expenditure by the Company upon the creation of capital assets, and of the sources whence the money has been found for that purpose. It will be apparent to you that, although at all times every effort is made by repairs and renewals to maintain the buildings, plant, mains, &c., of the undertaking in a proper and efficient condition, a time must arise in respect to certain portions of the plant (charged as a part of that expenditure), when that process is powerless to prevent it becoming obsolete and passing out of use. Our Engineer (Mr. Reeson), who arrived in March last, has been looking carefully into this matter, in order to arrive at some conclusion as to the amount of such worn-out assets, so that they may be dealt with; for it is quite clear that the expenditure in the capital account should have assets to approximately represent it. The one thing to be done in respect to such worn-out assets is to write them off the expenditure in the capital account, and as the profit and loss account is the only fund available for this purpose, I think it is right to advise you that, during the coming half year, the carry-forward will, in all probability, be considerably entrenched upon.

Mr. S. E. FIGGIS, who seconded the motion for the adoption of the report and accounts, congratulated the Chairman and the Board of Directors upon the highly satisfactory position of the Company, which he believed to be due in no small measure to the keen business acumen of the Directors and the excellent relations which existed between the management and the employees of the Company. He was particularly pleased to notice the reference made by the Chairman to the proposed introduction of the high-pressure lighting system, and thought that this would prove of considerable advantage to the Company. A large amount of gas would probably be used in this direction in the future—not only in Melbourne, but in the suburbs also. The shareholders would all look with interest to the future operations of the Company along this line.

Sir HENRY WEEDON supported the motion, and congratulated the Directors and management upon the excellent results of their efficient, careful, and economical work of the past year. The innovations made by the management to the advantage of the employees of the Company were thoughtful and well advised, and were calculated to engender good fellowship throughout the Company's service.

The motion for the adoption of the report and balance-sheet having been put and carried unanimously,

Mr. EDWIN PHILLIPS moved: "That a dividend of 6s. 6d. per share be declared out of the profits for the half year ended June 30, 1914."

Mr. A. W. FERGIE seconded the motion, which was agreed to.

The meeting then closed.

The "Main Fires for Every Home" are described and illustrated in the new season's fire catalogue of Messrs. R. & A. Main, Limited. This booklet refers briefly to the popular series of "D.S.O." barless fires, the "St. Nicholas" grate-fires, the "St. Magnus" radiators, &c.—all of which, the firm point out, embody maximum efficiency with the latest improvements in every respect known to science and practice. There are numberless illustrations of gas fires, radiators, and their accessories.

NEW SHOW-ROOMS OF THE BRITISH GAS LIGHT COMPANY AT HANLEY.

With the object of demonstrating the varied uses to which gas may be applied, the British Gas Light Company opened yesterday new show-rooms in Broad Street, Hanley, in which were displayed a comprehensive collection of modern stoves, fittings, &c. The general arrangement is shown in the accompanying photograph. It may be mentioned that the main show-room is over 60 feet long. It is on a level with the street, and the whole length can be seen from the footpath.

The exterior illumination of the show-room consists of two 1500-candle power lamps, in connection with which is a Keith and Blackman compressor driven by a ¾ H.P. gas-engine. These lamps cost less than 1½d. per hour. The interior of the show-room is lighted by a choice selection of high-pressure lamps and a low-pressure ventilating ceiling lamp. At the entrance, a striking feature is an elliptical arch, outlined with "Bijou" burners, and draped with plush curtains. Among the articles on view are a number of modern gas-fires, from various makers, fixed to different kinds of grates and mantelpieces; and there is a fine selection of cooking-stoves. In one of the show-cases is an array of British and Venetian beaded shades of attractive design. This case is effectively lighted from the top, with the view of illustrating the best method of lighting shop windows. Further along is a collection of British-made glass-ware for use with incandescent burners. The end wall of the apartment is covered by a large mirror, beneath which is a neatly arranged stand of three tiers, on which are exhibited the latest types of gas-fires suitable for the bedroom, nursery, dining and drawing rooms, and entrance halls, as well as gas-heated smoothing-irons for domestic and laundry use. A group of appliances shows how a supply of hot water for domestic use can be provided; and there is a model bath-room fitted with two modern geysers. Adjoining this room is a stand on which are shown gas-heated steam radiators. The show-room contains a large number of modern gas-fittings, some of which are extremely handsome, and are fitted with artistic silk shades. Prominently displayed are high-power gas-lamps for exterior shop lighting; and there are to be seen gas-driven ventilating fans and pneumatic switches by which the gas is not only controlled but lighted.

At the rear of the large show-room is another room which is being fitted up with gas appliances for industrial purposes, and will include special furnaces for annealing, pottery firing, &c., which will be placed at the disposal of local manufacturers for experimental purposes. High-pressure gas and air, as well as low-pressure gas, will be available for this purpose, free of cost. Gas engineers who have seen the show-rooms consider them to be among the finest in the country.

The new show-room has been arranged under the supervision of the Company's Engineer and Manager at Hanley, Mr. Harold E. Copp; and the whole of the plumbing and fitting-up has been done by their own workmen, under the supervision of Mr. H. Clark, the District Superintendent. What with these new show-rooms, a new show-room at each of the other two branch offices, slot installations, hire-purchase and maintenance schemes, and extensive alterations at the works, Mr. Copp (who was appointed only last April) is having a busy time, and is keeping things moving in the right direction.

THE BRITISH GAS COMPANY'S (POTTERIES STATION) SHOW-ROOM AS SEEN FROM THE MAIN STREET.

GAS MANAGEMENT IN THE POTTERIES.

Mr. Langford Appointed Chief Engineer.

At the last Meeting of the Stoke-upon-Trent County Borough Council, the minutes of the Gas Committee submitted for adoption contained the following :—

> The Committee considered the resolution passed by the Town Council at its meeting held on the 23rd ult., to the following effect: "That, pending the appointment of a Chief Engineer, Mr. Langford take over the control of the various works, and that we prepare and submit forthwith to the Committee a report upon the advisability or otherwise of combining the gas undertakings of the borough, in accordance with section 18 of the Stoke-on-Trent Federation Order, 1908."

The Town Clerk reported that he had communicated to Mr. Langford the foregoing resolution of the Council, and that he had received from him a communication stating that he had reluctantly come to the conclusion that he could not entertain taking over the control of the County Borough Gas-Works, and submitting a report thereon, unless satisfactory arrangements were first made regarding his future position and salary; but that, if equitable arrangements were made, and the Council honoured him with the appointment of Chief Engineer of their works, he would serve them faithfully and loyally, and felt sanguine that the results would merit their approbation. Mr. Langford's decision was, he continued, carefully considered by the Committee at a subsequent meeting, and they decided to take the necessary steps to obtain a rescission of the resolution of the Town Council—see *ante*, p. 241—precluding them from appointing a Chief Engineer until they had received a report on the linking-up of the various gas undertakings. This, apparently, was agreed to, and at a subsequent meeting of the Committee it was resolved that Mr. Langford be appointed Chief Engineer and Manager of the Corporation gas undertakings, at a salary of £700.

It was also resolved that Mr. Robert Surtees be appointed Deputy Gas Engineer of the Corporation "to render such services as are required of him at the several gas-works, and that he be resident at the Burslem works." It was further resolved that Mr. Langford immediately take over the control of the various works, and that he prepare and submit forthwith to the Committee a report upon the advisability or otherwise of combining the undertakings of the borough in accordance with the terms of the Federation Order.

Before the minutes were dealt with, the Council considered a notice of motion by Alderman Goodwin: "That the resolution passed by the Town Council deferring the appointment of a Chief Gas Engineer until the Committee have reported upon the question of combining the undertakings be rescinded." This was adopted by 35 votes to 17.

Alderman Mitchell then moved that the minutes of the Gas Committee be adopted.

Mr. Sampson Walker moved, as an amendment, that Mr. Langford's salary as Chief Engineer be £550 a year, and not £700 as was recommended

Several members, however, pointed out that Mr. Langford was getting this salary now, and the amendment was lost.

Alderman Geen (the Deputy-Mayor) then moved that £600 be substituted for £700, and that annual increments of £50 be granted until the salary reached £700.

This was carried by 29 votes to 25.

The minutes as amended were then adopted.

WELSBACH LIGHT COMPANY, LIMITED.

The Business and the War.

There was a good attendance of shareholders at the third annual general meeting of the Company, which was held on Friday last, at Winchester House, Old Broad Street, E.C., under the presidency of Mr. J. R. YATES (the Chairman).

The SECRETARY (Mr. E. J. Butcher) having read the notice convening the meeting and the certificate of the Auditors, the Directors' report and the accounts for the twelve months ended March 31 last were taken as read. The report, as already intimated, stated that as a result of the year's working a trading profit was shown of £13,461. The profit and loss account for the twelve months under review, after writing-off £4779, the whole of the preliminary expenses (incurred in 1911), showed a balance of profit carried to the balance-sheet of £3777. Deducting from this sum the adverse balance brought forward from last year—namely, £3165—a balance of profit amounting to £612 remained. Mr. R. Feuer and Mr. E. Lovinson had resigned their seats on the Board; and Mr. S. Sello's seat had been vacated. Mr. Robert Cars had been appointed a Director.

The CHAIRMAN, reviewing the figures contained in the accounts, said the trading profit of £13,461 compared with £5694 a year ago, and a loss of some £4300 in 1912. Thus as against the last-named figure, the present year showed an advance of something like £18,000. On this occasion, the item of interest was somewhat down, owing to the fact that a portion of the floating cash had been used for the redemption of debentures. The rate of dividend received on the shares in the Austrian Company was one-half of that for the previous year. The final item on this side of the profit and loss account was a new one—dividend on shares in "B. Cars, Limited," for the fifteen months to March 31, £3528. This, of course, related to the business acquired last year. On the assets side of the balance-sheet, there was a considerable reduction in the item of goodwill, patents, patent rights, trade marks, &c., owing to the difference between the nominal amount of debenture stock redeemed and the cost of purchase. This brought the figure down to £8697, for an item which in the old days, he believed, stood at something over £1,000,000. The value of the shares in "B. Cars, Limited," was sufficiently demonstrated by the dividend return to which he had already referred. The shares in the Austrian Company stood at approximately the same figure as hitherto. It was obvious that the outlook for this particular asset was for the present over-shadowed by the existing state of war. As to the future, he was not going to assume the position of a prophet. While looking patiently forward to the conclusion of the present armed conflict, they must do what they could to conserve the interests of the Company in this and in every other direction. During the year, extensive additions had been made to the freehold property. In reference to a sum of £15,000 placed on deposit with the Dresdner Bank, in London, the Board had already been in communication with Sir William Plender, and were doing all that they could to protect the Company's interests. The accounts showed there was a net profit of £3777, and that writing off the debit balance on the previous accounts they found themselves for the first time in the history of the present Company with a credit balance—namely, £612. The changes in the Board spoke for themselves. As regarded the trading since the outbreak of the war, notwithstanding all difficulties the Company had done, he thought, as satisfactorily as in the circumstances could reasonably be expected. Prices of raw material had increased; but this matter had been faced and dealt with to the best of their ability. The Company employed many hundreds of British hands in the manufacture and distribution of British products, and it was up to every shareholder to help the Directors to consolidate the business in every possible way. He concluded by moving the adoption of the report and accounts.

Mr. C. M. CROMPTON-ROBERTS formally seconded the resolution.

Mr. LOWRY asked what was the reason for putting £15,000 in the Dresdner Bank, and what banks it was taken from. Further, in view of the facts that the debenture interest was guaranteed by the German interests and the dividends from the Austrian Company would certainly not be forthcoming, he would like some assurance that the debenture interest would be paid.

Mr. COHEN inquired what proportion of the amounts on deposit with the Commerz and Disconto Bank (Berlin) and the Dresdner Bank had been withdrawn.

A SHAREHOLDER asked how the resignations of Mr. Feuer and Mr. Lovinson were received, seeing that no communication could be had with Germany. He remarked that to the extent of 60 per cent. the shares were held in Germany, and it was highly desirable that the Directors should take the shareholders into their confidence with regard to what was being done to protect English shareholders against the German interests.

The CHAIRMAN, in reply, said that the £15,000 deposited with the Dresdner Bank was floating cash that was available. It was not taken from any one source. As to why these deposits were made, in a trading company like theirs it was not always desirable to irrevocably deplete the cash resources, as would happen if debentures were purchased. The latter course had been adopted so far, he thought, as prudence dictated. Without question, the debenture interest would be duly met. The balance-sheet showed that the £15,000 deposited with the Commerz and Disconto Bank had been reduced to £12,500. With regard to the change of Directors, this matter had been carried out in an effective and proper way. He pointed out, in connection with the status of the Company, that the paramount interest was vested in the holders of the debentures, which to a very great extent were in British hands. The shares also were very largely held in this country. The paramount interest in the Company was held by English people. A majority of the shares were held in Germany. The mantles of the Company were manufactured in this country.

The report and accounts were adopted, the retiring Director (Mr. Robert Cars) and the Auditors (Messrs. Deloitte, Plender, Griffiths, and Co.) were re-elected, and a hearty vote of thanks was accorded to the Chairman and Directors. In the course of the speeches, emphasis was laid on the facts that it was to the interest of the German Company to help the English Company in every possible way, and that the English interests very largely predominated.

THE PRICE OF GAS IN EDINBURGH.

At the Meeting of the Edinburgh and Leith Gas Commissioners yesterday, the question of the advisability or otherwise of increasing the price of gas was under consideration. The Treasurer and Collector (Mr. A. Canning Williams) submitted two schemes, prepared by him in conjunction with the Engineer (Mr. Alexander Masterton), one drawn up on the basis of an increase in the prices of gas, as from October-November, of 2d. per 1000 cubic feet, except as regards the public and stair lighting, the rates in these cases having been fixed to May next; and the other on a proposal for a temporary reduction, under the powers conferred by section 7 of the Commissioners' Gas Order of 1908, of £9383 in the contribution to the special reserve fund (old works account), and no increase in price.

In drawing up the first scheme, the income for the current year was estimated to amount to £359,763, compared with £358,031 for 1913-14; the extra revenue of £9438 from gas (on the assumption that the quantity burnt would be the same as before) being nearly balanced by an anticipated fall of £7943 in residual products. At the close of the last financial year (May 15) there was a balance of surplus revenue of £6501. Adding this to the estimated income, there is produced a total of £366,264. The expenditure on revenue account is estimated at £254,620, or £16,700 less than in 1913-14. The principal decreases are: Coal, £8159; repairs of works and plant, £2224; rates and taxes, £3861. On this side of the account there is an item of £2600 for "salaries and wages of employees on war service, less Government pay." In arriving at this figure, it was assumed that the war would last till the end of the financial year. Adding the charges for annuities and interest, and the contributions to the sinking and reserve funds, the total debit against revenue is shown to be £366,097; leaving a surplus of £167. Under the second scheme, the contribution to the special reserve fund, which last year amounted to £16,827, is reduced to £7443. According to the section of the Order above referred to, the Commissioners are to contribute to this fund such a sum as will, over each period of five years, average an amount calculated at not less than 2d. per 1000 cubic feet of gas sold. This has hitherto been allocated. By the proposed reduced amount, which is equivalent to ⅝d. per 1000 cubic feet, the charge against revenue is temporarily relieved to the extent of £9383, and an increase in the price of gas this year rendered unnecessary.

The matter had been under the consideration of the Works Committee, who had resolved (by 12 votes to 3) to recommend the adoption of the proposal contained in the second scheme; and at the meeting of the Commissioners yesterday a motion that no increase be made in the price of gas was carried unanimously.

TODMORDEN GAS AND WATER SUPPLY.

In contradistinction to the electric undertaking of the Todmorden Borough Council, which discloses a deficiency of £1143 on the past year's working, the Gas Department have earned a profit of £1141. This, however, is not so satisfactory as a year ago, when the net profit was £1376. The gross profit on the twelve months was £7321, compared with £7567 the previous year. The total available for distribution was £6435—profits for year £1141, balance of profits brought forward from previous year £5118, and transfer from reserve fund (being interest on investments) £176. There was an expenditure of £175 on capital, in lieu of raising any further loans, and £225 for increased cost of coal. In addition, £1462 had been transferred to the district fund revenue account in aid of the rates (£318 of this eventually finding its way into the coffers of the Electricity Department, to meet a portion of the capital outlay of £640 in connection therewith), leaving a carry-forward of £4019. The gas reserve remains at £5000, and is invested. The loans outstanding on the undertaking on March 31, 1914, total £127,668; and a sum of £15,482 remains in the sinking funds as yet unapplied in repayment of the debt, thus making the net loan capital £112,186, as against £115,087 last year.

In connection with the water undertaking, the income from the sale of water and meter-rents was £3823, and from plumbing work, &c., £226—making a total of £4050. The working expenditure totalled £1685, leaving a gross profit of £2365, or an increase of £274 as compared with that of the previous year. Against this, however, had to be set the charges for sinking fund and interest, which amounted to £3913, thus transferring the gross profit into a deficiency of £1548 to be met by the district rate. Expenditure on capital account during the year amounted to £401, making the total outlay on the undertaking £96,928. The capital borrowed is £97,500, of which £16,639 has been repaid, leaving an outstanding sum of £80,860.

Nottingham Public Lighting.—At Nottingham a further instalment of high-pressure gas-lamps on the main line of thoroughfare leading from the Midland Station has already proved of marked advantage, while the conversion from upright to inverted burners of the lamps in the neighbourhood of the Guildhall and the University marks a further advance in the comprehensive scheme which is being carried out under the direction of Mr. W. A. Carter, the Lighting Inspector.

All-British Gas-Mantle Manufacturing Company (London), Limited.—On Sept. 22, a Company was registered under the title of the All-British Gas-Mantle Manufacturing Company (London), Limited, of No. 1A, Abbotsford Avenue, West Green, London, N., manufacturers of, and dealers in, mantles for incandescent gas-burners, or any other lines of artificial light, and all articles connected with the manufacture and packing of mantles. The nominal capital is £625 in £1 shares. The first Directors are to be appointed by the subscribers, who are (125 shares each): W. H. Dorey, of Austin Friars; W. H. Cobb, of Brookwood; N. M. Carnell, of Earl's Court; and S. Franklin, of Stoke Newington. These particulars are from the "Daily Register" of Messrs. Jordan and Sons, Limited, Chancery Lane, W.C.

EXPORTATION OF SULPHATE OF AMMONIA.

There was issued last week, by the Commercial Intelligence Department of the Board of Trade, a further pamphlet of the series on the subject of the trade in German and Austrian goods, to which reference has already been made in the "JOURNAL." It furnishes particulars as to the fertilizers exported from Germany, Austria-Hungary, and the United Kingdom; and the following relate to sulphate of ammonia.

In the year 1912 there was exported from Germany sulphate of ammonia to the value of £702,800; from Austria-Hungary in 1913, £327,000 worth; from the United Kingdom, £4,390,500 worth. In the first-named year Germany exported to the United Kingdom sulphate of ammonia to the value of £700. Two-thirds of Germany's exports go to the Netherlands and Belgium. German and Austrian competition is keen in the Italian market; but elsewhere—particularly in Ceylon, France, Portugal, Spain, Dutch East Indies, and the United States—the United Kingdom holds a very strong position. There would appear to be opportunities for extending our sales of sulphate of ammonia in the Netherlands, Belgium, France, Italy, the Dutch East Indies, and Brazil.

According to a recent Austrian consular report from Moscow, the use of artificial manures in Russia is in a very backward state; Russia being computed to employ only 5 per cent. of the quantity of artificial manure which would be used in Germany over an equal area. The Government are, however, doing a great deal to alter this state of things by the establishment of model farms and of a low tariff favourable to the increase of import business.

His Majesty's Consul at Warsaw, in his report for 1912, stated that up to then sulphate of ammonia had been made in only one chemical factory in Poland; but the output was sufficient to meet the demands of the market. Large chemical plants are, however, in course of construction in South Russia for the production of this article. This will probably lead to a fall in the price; thereby creating a serious competitor of nitrate of soda.

The French Consul at Tientsin remarked in his report for 1912 that the contemplated establishment of sugar refineries in Manchuria must soon necessitate considerable fertilization of the soil. He mentioned that the Chinese have hitherto been slow to take advantage of the various chemical manures, but that in the neighbourhood of the large towns they are now commencing to use sulphate of ammonia and nitrate of soda.

According to an Austrian consular report from Yokohama for 1912, the consumption in Japan of artificial manures, mostly imported from abroad, has increased enormously during recent years. The sulphates come principally from England, and phosphates from the South Sea regions. The importations of sulphates have increased to eighteen times the quantity recorded for ten years ago. The consumption of artificial manures in Japan is, however, very heavily handicapped by the extremely limited financial resources of the majority of the small landowners and by the heavy taxes; so that when it is remembered that 60 per cent. of the population is still agricultural, the employment of artificial manures is very small in comparison with that of other agricultural countries. A further increase in this branch of commerce is, however, to be expected.

Reporting upon the trade in the Shimonoseki district in 1912, the Acting British Consul stated that sulphate of ammonia and nitrate of soda had given way to rape cake, which was much cheaper. The importation of the former, however, had increased considerably, owing to the demand of the local ice factories which have sprung into existence concurrently with the development of the trawling industry.

A NEW YORK CHEF ON THE VALUE OF GAS.

The current number of the "Gas Record" contains the following testimony by M. Bailly, *chef* of the Hotel St. Regis, New York—one of the most splendidly appointed hotels in the city—to the value of gas for culinary purposes. He says: "One of the greatest advantages of gas is the ease with which you can control it. One needs only to move a finger to have the heat as intense or as low as one likes. That is a great thing. It enables the cook to give his dishes much more delicate flavours than he can secure in any other way. In making soups, which require slow cooking, this is especially important. There is not the great waste in cooking by gas that there is when you burn coal. Foods do not shrink away so much. They can be left standing on top of the range with the gas turned low under them for long periods if necessary. The great saving in floor space, the much lower kitchen temperature, and the better working conditions generally are all strong points for gas in hotels. Still another thing in favour of gas—and this is a factor of great moment in large establishments such as a New York City hotel—there is comparatively little wear and tear on the cooking utensils themselves. On the other hand, the annual depreciation of these vessels and receptacles in a large hotel or restaurant when coal is burnt runs into many hundreds of dollars. Finally, the fact that the gas company regularly and frequently inspect all hotel cooking appliances and make any repairs to those which they have themselves installed is a strong argument for gas. Where coal is burnt the coal-ranges and other appliances have a limited life, and all repairs have to be paid for by the hotel or restaurant owner himself."

In the above-named hotel, the approximate number of meals prepared in the busy season is 2500 per day. This is a stupendous undertaking. In carrying it out, there is fixed on one side of a long white kitchen a seven-section hotel gas-range, 21 feet long. Beside it stands a gas-fired salamander, used for giving to cooked meats, fish, &c., the delicate browning which is one of the principal essentials in the proper preparation of many of the most appetizing foods. The quick, intense heat of gas makes it possible to accomplish this browning far more perfectly than in any other way. Among the other gas appliances in the hotel is a large toaster, by means of which thousands of pieces of bread and crackers are toasted every day with the greatest ease and remarkable speed. In the special kitchen, where all the meals for the hotel's nearly 500 employees are prepared, there are two more gas-ranges; while the general kitchen equipment includes devices for cooking oysters, singeing chickens, &c.

ANTWERP WATER-WORKS COMPANY, LIMITED.

Position of the Property and Finances.

The Directors of the Antwerp Water Company have issued a notice expressing their regret that they are unable to send to the shareholders the usual audited approximate profit and loss account for the half year to June 30; the outbreak of war on the Continent making it impossible for the Auditors to proceed to Antwerp for the purpose of making the usual audit. The Directors, however, are able to say that the figures for the six months show, subject to audit, that the profitis rather more than it was for the corresponding period last year. While they are pleased to report that the property of the Company is undamaged, and the supply of water to the city is continued as usual, it will be apparent to everyone that the effect of the war has been to paralyze trade and industry of all kinds. In these circumstances, the revenue must be seriously diminished and it is absolutely necessary to guard such revenue as may be collected to carry on the business in Antwerp, to provide for exceptional expenditure caused by the war, and for possible contingencies. In view of the uncertainty of what the future may have in store for those concerns which are situated in Belgium, the Directors feel it will be in the interests of the shareholders to postpone the consideration of the payment of an interim dividend until such time as they are able to see more clearly the course events are likely to take. At the earliest possible moment they will distribute such interim dividends as the funds at disposal permit, and they hope that this distribution may not be long deferred.

Imperial Continental Gas Association's Distribution.—The Association announce that, though, owing to the absence of returns from the stations, it will not be possible for the Directors to prepare a report and balance-sheet, &c., for the half year ended June 30, the Board have decided to recommend, at the half-yearly general meeting to be held on Nov. 3, a distribution from the reserves in lieu of dividend of a sum equivalent to 2¼ per cent. on the £4,940,000 stock of the Association. This distribution, if approved by the proprietors, will be made on Nov. 14.

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NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The subject of the public lighting of Edinburgh was referred to at the meeting of the Town Council last Tuesday. It came up first in a motion by Treasurer M'Leod for the adoption of the report of his Committee in regard to the rate of assessment to be imposed for the current year. In the course of a brief review of the financial situation, he stated that the net estimated expenditure was fixed at £448,420—an increase of £15,530 over the estimates of last year. He said this figure might, with some internal adjustment of the accounts and mutual accommodation between the various departments, be accepted as the measure of the estimated expenditure for the year, and it might be done without restricting employment or labour to any extent. The main saving would be in the Lighting Department; and here it would be necessary to obtain the general concurrence and approval of the public to the step proposed. The lighting of Edinburgh was undoubtedly exceptionally generous; it had the reputation of being even a lavishly lit city. There was certainly room for some temporary abatement, especially in the streets where traffic was light, without causing any inconvenience or hardship; and it had to be remembered that at this time other cities were compulsorily restricted in lighting by the military authorities. He had no doubt the public would, in the circumstances, readily fall in with the modification proposed.

The other reference to the public lighting was made by Mr. Bruce Lindsay, the Convener of the Cleaning and Lighting Committee, who moved the approval of the recommendation, alluded to in last week's "Notes," that the present modified lighting of the public streets should be continued during the war. He held that the town was sufficiently lit for all practical purposes, and for the purposes of safety. If they were to keep up a full system of lighting, they would have to stand an increase of about £5000. Mr. Watson seconded the motion. Mr. Stevenson submitted that public safety demanded an increase in the number of lamps. There were 514 arc lamps not in use at the present time, and 322 of these were on the main tramway routes. He moved, as an amendment, that the lighting of these 322 lamps should be restored. The amendment was, however, defeated by 33 votes to 5; so that the restricted lighting system will be continued, on the understanding that members are at liberty to bring forward any cases of special hardship.

In Treasurer M'Leod's review of the financial position of Edinburgh, already referred to, he stated, in regard to the assessable rental of the city, that there was unfortunately a decrease of £22,000 this year in the valuation as compared with last year. This decrease was entirely owing to the lower valuation of the gas undertaking, which varied from time to time, as it was calculated on the basis of profits for the year. The decrease on this account was actually £30,000; but it was alleviated by an increase of £8000 in respect of other properties.

Aberdeen, like so many other places, is to have only a restricted lighting service, in accordance with instructions received by the Town Council from the Admiralty. The Lighting Committee have decided to reduce to a considerable extent the number of lamps to be lighted, and to replace all arc lamps by electric incandescent burners. Tramcar lighting is to be reduced. Shopkeepers are asked to discontinue lighting their shop windows, and householders to screen their windows after dusk by dark blinds.

At a special meeting of the Peterhead Town Council last Tuesday evening, Mr. Gordon, the Convener of the Gas Committee, submitted the abstract statement of the accounts for the year ended the 15th of May. During this period there were produced 67,666,200 cubic feet of gas, which was by far the largest total yet reached; the nearest approximation to this figure being that for the previous year, when the total production was 65,347,300 cubic feet, or 2,318,900 cubic feet less than for the year 1912-13. In addition to increased production, Mr. Gordon's Committee had been successful to a very great extent in reducing the quantity of gas unaccounted for. From a percentage of 16·27 two years ago, it had been brought down to 8·83. What the Committee had achieved was a matter of vital importance, as, even taking the decrease for the previous year, which amounted to 2,432,600 cubic feet, and reckoning this at 3s. 6d. per 1000 cubic feet (the price of gas was 3s. 8d.), they had a saving of £445 19s. 7d. The amount realized from the sale of gas was £10,688, against £8822 in the previous year; but the Committee were under the unpleasant necessity of increasing the price by 6d. per 1000 cubic feet. Last year they carbonized 7128 tons of coal, or 341 tons more than before. The price was much higher—the average per ton being 20s. 3d., against 17s. 7d. For coals for the year completed £7213 had been spent, against £6140. During the year the Committee had a number of very serious factors to contend with; but the balance carried to the net revenue account amounted to £2589. Of this sum, £2077 was applied in payments to the sinking fund and interest, £100 to the special capital reserve fund (making up the £700 for the first year), while a sum of £321 was transferred to the depreciation and renewal fund. They had still unappropriated a balance of £606 at their credit in the net revenue account. With regard to the current year, in view of the disastrous results which must necessarily be occasioned by the war, it would not serve any good purpose to deal with them in detail. During the last two years the Committee had had a very busy time, as they had successfully carried out the improvements, alterations, and replacements which had been recommended. They therefore considered that the gas-works were now in a thoroughly satisfactory state. The accounts were adopted.

A visit was paid last Wednesday by the members of the Dundee Gas Committee to the gas-works, where they were afforded an opportunity of inspecting the installation of Woodall-Duckham vertical retorts which is now nearing completion. The party were under the guidance of the Gas Manager (Mr. Alexander Yuill); the Convener of the Committee (Mr. R. M. Noble) being also present. The work was found to be in an interesting stage; some of the retorts being heated-up, while others were in process of building. The sound

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opinion expressed by a local paper is that the new retorts should greatly increase the efficiency of the Dundee Gas-Works.

At a meeting of the Ardrossan Town Council, Bailie Fawcett, the Convener of the Gas Committee, made a statement as to the finances of the Gas Department, which is in a flourishing condition; the net profit for last year having been £493. It has consequently been decided to reduce the price of gas by 2½d. per 1000 feet; bringing the charge down to 3s. 11½d., and at the same time to increase to 15 per cent. the amount of the abatement to trade customers.

With the view of augmenting the water supply, the Glasgow City Council have decided to adopt one of two courses—(1) to submit again to Parliament the Loch Voil scheme, either alone or in conjunction with the River Turk scheme; or (2) to submit schemes for utilizing the waters of the Turk and Duchray without Loch Voil, as may be determined on the advice of the engineers. The Duchray is a tributary of the Forth, joining it about a mile above Aberfoyle. The Turk flows into Loch Vennachar.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 28.

There is little business to report in tar products, and prices generally remain without change at the figures last recorded. The demand for 60's crude carbolic acid and 90 per cent. toluol continues good; the latest heard of for 60's crude being 2s. 3½d. per gallon, on usual terms.

The position in sulphate of ammonia remains unaltered; the difference between the ideas of makers and sellers being very wide. Makers still call the price £10 15s. per ton, net and naked at makers' works, for 25 per cent. quality; but, in the absence of business, this is nominal.

Tar and Tar Products in the Provinces.

Sept. 28.

There is no alteration in the values of tar products, and prices remain about the same. There is not very much inquiry in benzol; but there is a steady market for solvent and heavy naphthas, though no improvement in the prices. Crude carbolic keeps fairly steady, although there appears to be more offering.

Average values during the part week. Value of liquid products in one ton of tar, 15s. 9d. to 17s. 3d. Benzol, 90 per cent., naked, North, 9¼d. to 10d.; 50-90 per cent., naked, 9¼d. to 10d. Toluol, naked, North, 1s. 2½d. to 1s. 3d. Crude naphtha, in bulk, North, 4¾d. to 5¼d. Solvent naphtha, naked, North, 10d. Heavy naphtha, naked, North, 11d. to 1s. Creosote, in bulk, North, 3¼d. to 3½d. Heavy oils, in bulk, 4d. to 4¼d. Carbolic acid, casks included, 60 per cent., East Coast 2s. 1d. to 2s. 2d. Naphthalene, £5 to £10; salts, 50s. to 55s., bags included. Anthracene, "A" quality, 1¾d. to 2d.; "B" nominally ¾d.

Sulphate of Ammonia Prices in the Provinces.

LIVERPOOL, *Sept.* 26.

During the past week the market for this article has remained without animation. There has been some demand for replacing German sulphate bought a few months ago for September and October shipment, but this has been counteracted by other buyers postponing deliveries against contracts on account of the difficulties in finance. The closing quotations are £10 6s. 3d. per ton f.o.b. Hull, £10 7s. 6d. per ton f.o.b. Liverpool, and £10 8s. 9d. per ton f.o.b. Leith. There has again been little interest shown in the forward position, both manufacturers and distributors having continued to adopt a waiting policy.

Nitrate of Soda.

This market has remained dull, but spot values have not receded below 10s. 4½d. per cwt. for ordinary, and 10s. 7½d. for refined quality.

Sulphate of Ammonia.

From another source it is reported that the market for this article is not very firm, and there is considerably more offering both for prompt and forward delivery. Outside London makes are quoted at £9 7s. 6d. to £9 10s.; Hull, £10 6s. 3d.; Liverpool, £10 7s. 6d.; Leith, £10 10s.; Middlesbrough, £10 7s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade seems to be a little more active; the home demand being better and the exports to France and Italy well maintained. In the steam coal trade, best Northumbrians are steady at 13s. 1½d. per ton f.o.b.; second-class steams are 11s. 6d. per ton; and steam smalls are not quite so plentiful, and are quoted from 8s. to 9s. 3d. per ton f.o.b., according to the quality. Work at the collieries is a little better on the average; but some of the pits north of the Tyne are still working very short time. In the gas coal trade, the deliveries on the long contracts are now increasing, and in addition there are rather more export cargoes being sent out. The Mediterranean demand is better for gas coals; but the freights are high to the Italian ports at present. Best Durham gas coals are firm at 12s. 6d. per ton f.o.b.; second-class qualities are about 11s. to 11s. 3d. per ton; and "Wear Specials" are from 12s. 6d. to 12s. 10½d. per ton f.o.b. The demand for the last-named kind is full, and gives fair average employment to the collieries producing them; while the inquiry should increase for gas coals generally as the nights lengthen—the home consumption being now without the difficulties in the foreign trade. The freight on coals to London is above the autumn average. Coke is steady, with a slightly better demand for shipment. Gas coke is from 12s. to 12s. 6d. per ton f.o.b.; and the stocks are heavy at some works.

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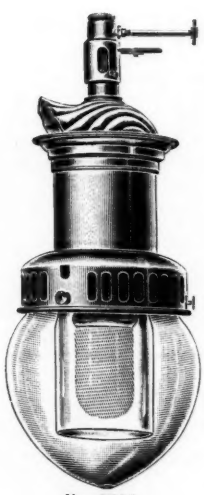

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Oswaldtwistle Gas Undertaking.

The gross profit on the past year's working of the Oswaldtwistle Gas Department was £4386 (equal to 8 per cent. on the capital outlay of £54,489 at the commencement of the year), compared with £5651 for the preceding year. This was a decrease of £1265. The cost of carbonization increased by £1194, mostly due to the higher price of coal. The sinking fund instalment absorbed £1906, and interest on loans £731; and after crediting dividends there remained a net profit for the year of £1824. The total rental for gas consumed during the year amounted to £9732, of which £475 was for public lighting; and after deducting £671 for discounts, &c., there was a net income from gas-rental of £9061, against £8553 for the previous year. The consumption of gas showed an increase of 4,897,900 cubic feet.

Oldham and Coke.—The Oldham Gas Committee have a large stock of coke on hand. The Chairman of the Gas Committee (Alderman H. Wilde, J.P.) referred to this fact at the last meeting of the Committee, and suggested that they might consider selling it during the winter in small quantities at a low price for the benefit of poor people. Mr. Stanbury thought the matter was one for the Relief Committee to deal with; but in the end the subject was allowed to stand over, Alderman Wilde remarking that if the question of further relief became more pressing he would summon a special meeting of the Gas Committee.

Increase of Price at Canterbury.—The Directors of the Canterbury Gas and Water Company announce that the price of gas to ordinary consumers will be increased, as from the date of recording the meter indices for the current (September) quarter, 2d. per 1000 cubic feet—from 2s. 8d. to 2s. 10d. in the Canterbury area, and from 3s. to 3s. 2d. in the outlying districts. The advance does not apply to gas consumed through automatic meters. The Directors state that they had hoped to tide over the period of high-priced coal and other raw materials without an increase in the charge for gas; "but they find this impossible, owing to the many exceptional circumstances arising out of the war, and are reluctantly compelled to follow in the footsteps of the London Companies, who have announced a similar increase."

Chiltern Hills Spring Water Company.—The report adopted at the second ordinary general meeting of the Chiltern Hills Spring Water Company stated that the Company continued to make satisfactory progress; and the Directors recommended that a dividend at the rate of 7 per cent. per annum (free from income-tax) should be declared for the half year ended June 30. The accounts showed a net profit for the half year of £3353, which, with a balance of undivided profit from the last account of £1267, made a total of £4620. The dividend as recommended on £44,390, the subscribed capital, would absorb £1553, which, with a further contribution to the general reserve of £1500, and a balance of £1567 to be carried to the next account, made up the total of £4620.

Unprofitable Electric Lighting in the Potteries.

At the meeting of the Stoke-on-Trent Federated Council last Thursday, the Chairman of the Electricity Committee (Alderman H. Leese) presented the annual accounts of the combined electricity works of the borough, which showed a total loss of £6162 on the year's working. The total revenue was £52,560, and the gross profit £16,629. But after paying sinking fund charges there was a net loss of £5139, to which was added £1023 on account of capital expenditure paid out of revenue. The loss was chiefly accounted for by extraordinary repairs to plant, increase in rate assessment, and the higher cost of fuel. Alderman Leese said he felt confident that when the new central power-house had overcome its initial difficulties there would be a great improvement in the financial position of the works. They had increased their output from 6 million to 7 million units, and their revenue by £5474. Alderman Geen criticized the accounts, and said he thought the Corporation were entitled to have a profit and not a loss returned upon an undertaking in which £320,000 of public capital was invested. The Mayor (Alderman Philip Elliott) confessed that when he received the accounts he was amazed. He thought that it was an alarming statement, and that there was need for the Electricity Committee carefully to consider the position of the undertaking.

Torquay Gas Company.—The half-yearly meeting of the Torquay Gas Company was held last Tuesday, Mr. R. P. Kitson presiding. The profits for the six months were £2616, against £3532 last year. The increased price of coal and oil accounted for an additional expenditure of nearly £1000; and workmen's wages were also more. There had been an increase of about £600 in the sales of gas. The usual interim dividends were declared of 10 and 7 per cent. on the respective classes of shares.

Artificial Dyes and Coal-Tar Colours.—In the House of Commons before the adjournment, Mr. Hodge asked the President of the Board of Trade whether aniline oil was placed as contraband of war on the list issued on the 11th inst. by the Government, and was he aware that previous to the war Germany dominated neutral markets, and that by its inclusion unemployment would result and the endeavour to capture neutral markets would be prevented. Mr. Runciman thought the question had been framed under a misunderstanding. He added: It is true that previous to the war Germany was the largest producer of aniline and other artificial dye-stuffs, which are largely used in the British textile and other manufactures. Efforts are now being made to fill the gap by extending the production of these dye-stuffs in the United Kingdom; and with this object, and also with the object of diminishing the shortage in the interval, the export of artificial dyes and of coal-tar products for use in dye manufacture has been prohibited. The effect, it is hoped, will be to decrease and not to increase unemployment in the important groups of trades dependent on dye-stuffs.

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Progress of the City of London's New Lighting Scheme.

At the meeting of the Court of Common Council of the Corporation of London, on Thursday last, Mr. Richard Davies asked the Chairman of the Streets Committee as to the progress of the lighting of the City by means of centrally hung lamps, and whether the new arrangements had resulted in a saving to the ratepayers. Mr. G. W. Young, the Chairman of the Streets Committee, said he was pleased to inform the Court that the new scheme of lighting by gas and electricity was practically complete. Arrangements had been made with the Gas Light and Coke Company and the City of London Electric Lighting Company, Limited, covering a period of ten years, whereby an annual saving of over £6000 of the ratepayers' money would be effected, with an increase in illuminating power of over 600,000 candles.

Improved Lighting for a Public Library.

At a meeting of the Lambeth Borough Council on Friday, the Library Committee reported they had for some time had under consideration the question of the improvement of the lighting at the North Lambeth Public Library, and in connection therewith they had had submitted to them a scheme prepared by the South Metropolitan Gas Company to provide new fittings and instal inverted incandescent burners in lieu of the upright burners now in use in the library. The total candle power of the existing installation was about 6750, and the gas consumption 550 cubic feet per lighting hour; while with the proposed installation the candle power would be increased to 7850, and the gas consumption reduced to approximately 385 cubic feet per lighting hour—representing an increased illumination of 1000 candle power, with a reduction of gas consumption of some 165 cubic feet, or a saving of from 3½d. to 4d. per hour. The estimate for altering and bringing up to date the lighting installation under the proposed scheme was £60. In order to obtain satisfactory and economical results, it was suggested that the burners should be under maintenance; and the Company undertook to keep clean all burners and lamps, and to renew the mantles when necessary, to the satisfaction of the Chief Librarian, for a special inclusive charge of £2 10s. per quarter, exclusive of renewing glassware. The Council decided to accept the offer of the Company for the installation and maintenance.

The Hawes Parish Council have accepted the tender of the Hawes Acetylene Gas Company for the lighting of the town this winter; the price being £25 for a twenty weeks' supply. It is interesting to note that for the past two years the Hawes streets have been illuminated by electricity; but now acetylene has displaced it.

An interim dividend of 3 per cent. for the six months ended June 30 is announced by the Bombay Gas Company; and one of 3½ per cent. (7 per cent. per annum), less tax, by the South African Lighting Association. An interim dividend on the 6 per cent. cumulative preference shares of the San Paulo Gas Company will be payable, less tax, on and after the 1st prox.

A Local Government Board inquiry has been held by Mr. Stanford, with regard to an application by the Kidderminster Rural District Council to borrow £1500 for the purpose of carrying out a water scheme for the parish of Wribbenhall. There was no opposition to the scheme, which it was stated was based on an arrangement with the Bewdley Town Council to take water in bulk at 4½d. per 1000 gallons; the Bewdley Water-Works being in Wribbenhall parish, and the main passing through the village. Evidence was given by the Water Manager (Mr. Humpherson) as to the ability of the works to supply the requirements.

Messrs. R. & A. Main, Limited, of Edmonton, have compiled (and had tastefully printed) a circular headed "On the Matter of True Economy in War Time," copies of which they offer to supply in any numbers to gas undertakings. In a covering-letter, they remark that, at the time of the appearance of a leading article in the "JOURNAL" for Sept. 1, they had already taken steps to draw up a circular dealing with some of the points raised therein. The "logical points" are so logical that we may be permitted to quote the opening passages of the circular: "A well-known professor has just likened our national income to 'a great flowing stream from organized industry.' This is a true simile; and it is well for us all to consider how we can best support this flow—and, conversely, how disastrous would be the result were we individually to assist in damming it. Are not our monetary interests, investments, incomes, all bound up directly or indirectly with trade? Admitting this primary fact, is it too much to assume as a logical sequence that ultimate trading results must be influenced by the contributions of each and every one of us? In effect, the welfare of us all lies largely in the maintenance of regular employment, and to this we all can, and should, readily subscribe. If the subject be narrowed to a more definite application—to wit, the economical use of gas—there are a few points that may well be noted. Your local gas undertaking is itself a large employer of labour, and any decrease in the output of gas carries with it an obvious reduction in labour employed. Less gas means less coal required, and a corresponding reduction in miners' wages; and so on through all the industries that combine with gas undertakings in facilitating the public use of the commodity. By supporting your gas undertaking you aid your country, your fellows, and yourself." There follow considerations of a few practical advantages in the use of gas for domestic purposes.

APPLICATIONS FOR LETTERS PATENT.

19,846.—RIESCO, A., "Gas-generators." Sept. 16.
19,847.—POPE, C. E., "Gas-washers." Sept. 16.
19,875.—SISSON, H. T., "Measuring the flow of liquids." Sept. 17.
19,891.—EBERHARDT, A. C., and SHORT, E. A., "Interchangeable gas and electric light fittings." Sept. 17.
19,927.—HALL, I., "Burners." Sept. 18.
19,954.—CLIMIE, W., JUN., and LEES, W., "Manufacture and treatment of gas." Sept. 19.

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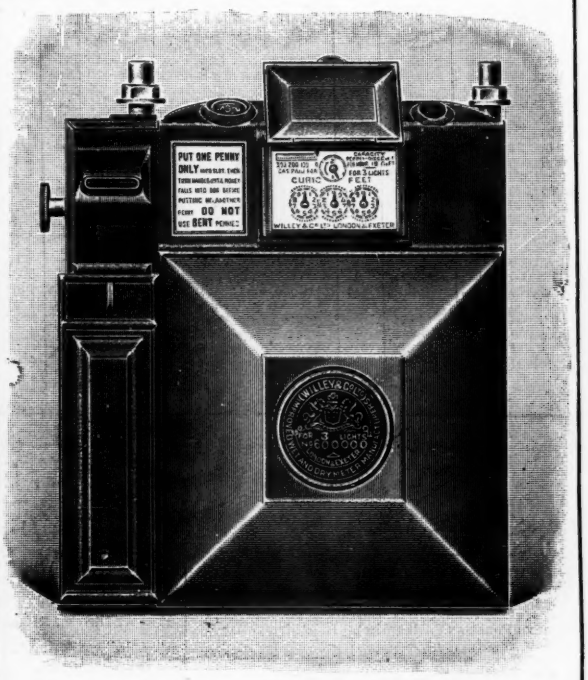

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GAS COMPANIES IN THE STOCK EXCHANGE.

Not much has been accomplished, so far as the eye of the ordinary observer can penetrate, during the past week towards the resumption of normal conditions of business, beyond the announcement by the Government that the Moratorium is to come to a close in November. But how far this may influence a solution of the Stock Exchange problem remains to be seen. A sort of tug-of-war is going on between the Exchange and the Banks, and the apportionment of blame to be ascribed to either side varies according to the interests of the parties delivering judgment. Meanwhile, a moderate amount of business under the limited official price list's conditions has been done; and the general tendency, inspired by fairly satisfactory sentiments entertained in regard to the course of the gigantic struggle on the Aisne, was in favour of rather firmer figures. Consols have been steady at about 68⅝. There was some inquiry for gas debenture stocks of the best quality. The Imperial Continental Gas Association announce that military operations rendering impossible the preparation of a report and statement of accounts for the June half year, the Directors have resolved to recommend the distribution out of the reserves in lieu of dividend of a sum equal to 2½ per cent. on the capital. This is equivalent to one-quarter year's dividend at the rate of 9 per cent. per annum, which rate has been paid for some years past. The price of the Association's stock was unofficially stated at 110; but this is quite nominal, and we cannot say whether any changed hands. In the Money Market, the supply was superabundant, and very light rates were obtainable for short loans. Discount was very quiet, but firm.

OFFICIAL QUOTATIONS AT THE CLOSE OF THE STOCK EXCHANGE ON JULY 30.

Bank Rate (fixed Aug. 8), 5 per cent. Last year, 4½ per cent. Consols, —. Previous week, —.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	April 8	2½	Alliance & Dublin Ord.	59 –64	..	3 18 2	75,000	5	June 11	6	Malta & Mediterranean	4½–4⅝	..	6 9 9
374,000	,,	July 10	4	Do. 4 p.c. Deb.	76–79	..	5 1 3	250,000	100	April 1	4½	Met. of Melbourne 4½ p.c. Deb.	99–101	..	4 9 1
280,000	5	April 29	7½	Bombay, Ltd.	5¼–6⅜	..	5 17 8								
50,000	10	Feb. 26	16	Bourne-mouth Gas and Water: 10 p.c.	29–30	..	5 6 8	541,930	20	May 28	4	Monte Video, Ltd.	11½–12	..	6 13 4
878,480	10	,,	7	B 7 p.c.	15–15½	..	4 10 4	1,775,892	Stk.	July 29	4½	Newc'tle&G'tesh'd Con.	98½–99½	..	4 10 6
95,000	10	,,	6	Pref. 6 p.c.	13½–14	..	4 5 9	529,705	Stk.	June 26	8½	Do. 3½ p.c. Deb.	82–83	..	4 4 10
880,000	Stk.	Feb. 26	14	Brentford Consolidated	261–266	..	5 5 3	55,940	10	Feb. 26	7/14/0	North Middlesex 7 p.c.	14–15	..	5 2 8
830,000	,,	,,	11	Do. New	204–209	..	5 5 3	300,000	Stk.	May 14	8	Oriental, Ltd.	117–122	..	6 11 2
50,000	,,	,,	5	Do. 5 p.c. Pref.	109–111	..	4 10 1	60,000	5	Mar. 26	10	Ottoman, Ltd.	7½–7⅝	..	6 9 0
206,250	,,	June 11	4	Do. 4 p.c. Deb.	91–93	..	4 6 0	60,000	50	Feb. 26	18	Portsea, Island B	128–131	..	4 19 3
217,880	Stk.	Feb. 26	11	Brighton & Hove Orig.	208–213	..	5 3 4	100,000	50	,,	12	Do. C	118–121	..	4 19 2
244,200	,,	,,	8	Do. A Ord. Stk.	154–159	..	5 0 8	249,980	5	April 29	8	Primitiva Ord.	5½–6	..	6 13 4
630,000	20	Mar. 26	12½	British	44–45	..	5 11 1	499,960	5	June 26	5	,, 5 p.c. Pref.	4⅝–5	..	5 0 0
120,000	Stk.	June 26	4	Do. 4 p.c. Deb. Stk.	88–90	..	4 8 11	521,600	100	June 2	4	,, 4 p.c. Deb.	91–93	..	4 6 0
345,771	Stk.	June 26	4	Buenos Ayres 4 p.c. Deb.	85–87	..	4 12 0	346,198	Stk.	June 26	4	River Plate 4 p.c. Deb.	85–87	..	4 12 0
100,000	10	—	—	Cape Town & Dis., Ltd.	1½–2½	..	—	150,000	10	May 14	6	San Paulo 6 p.c. Pref.	10½–11	..	5 9 1
100,000	10	—	—	Do. 4½ p.c. Pref.	4–6	..	—	125,000	50	July 1	5	5 p.c. Deb.	47–49	..	5 2 0
100,000	Stk.	June 26	4½	Do. 4½ p.c. Deb. Stk.	70–75	..	6 0 0	135,000	Stk.	Mar. 12	10	Sheffield A	223–224	..	4 9 3
157,150	Stk.	Feb. 26	5	Chester 5 p.c. Ord.	103–110	..	4 10 11	209,984	,,	,,	10	Do. B	222–224	..	4 9 3
1,518,280	Stk.	Feb. 12	5/9/4	Commercial 4 p.c. Stk.	106–108	..	5 1 2	523,503	,,	,,	10	Do. C	220–222	..	4 10 1
560,000	,,	,,	5½	Do. 3½ p.c. do.	103–105	..	5 1 6	90,000	10	May 28	9	South African	10½–11½	..	7 16 6
475,000	,,	June 11	8	Do. 3 p.c. Deb. Stk.	69½–71½	..	4 3 11	6,429,895	Stk.	Feb. 12	5/9/4	South Met., 4 p.c. Ord.	111–113	..	4 16 8
800 000	Stk.	,,	4	Continental Union, Ltd.	76–79	..	5 1 3	1,895,445	,,	July 10	8	Do. 3 p.c. Deb.	72½–74½	..	4 0 6
200 000	,,	,,	7	Do. 7 p.c. Pref.	115–118	..	5 18 8	209,820	Stk.	Feb. 26	8½	South Shields Con. Stk.	157–159	..	5 6 11
492,270	Stk.	—	6	Derby Con. Stk.	123–125	..	4 16 0	952,795	Stk.	Feb. 26	6	S'th Suburb'n Ord. 5 p.c.	114–116	..	5 3 5
55,000	,,	—	4	Do. Deb. Stk.	102–104	..	3 16 11	60,000	,,	,,	5	Do. 5 p.c. Pref.	110–112	..	4 9 3
1,002,180	10	July 29	10	European, Ltd.	17½–18*	..	5 11 1	137,058	,,	June 26	5	Do. 5 p.c. Deb. Stk.	116–118	..	4 4 9
16,362,910	Stk.	Feb. 12	4/17/4	Gas 4 p.c. Ord.	98–102	..	4 15 6	629,740	Stk.	May 14	5	Southampton Ord.	99–102	..	4 18 0
2,600,000	,,	,,	3½	Light and Coke: 3½ p.c. max.	76–79	..	4 8 7	120,000	Stk.	Feb. 12	7½†	Tottenham District: A 5 p.c.	135–138	..	5 8 8
4,062,235	,,	,,	4	4 p.c. Con. Pref.	96–99	..	4 0 10	742,275	,,	,,	6†	B 3½ p.c.	115–117	..	5 2 7
4,674,850	,,	June 11	3	3 p.c. Con. Deb.	72½–74½	..	4 0 6	181,255	,,	June 26	4	4 p.c. Deb.	87–89	..	4 9 11
258,740	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	87–89	..	5 12 4	182,380	10	Dec. 30	5	Tuscan, Ltd.	5–6	..	8 6 8
70,000	10	April 29	11	Hongkong & China, Ltd.	16½–16⅝	..	6 11 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	93–95	..	5 5 3
131,000	Stk.	Mar. 12	7½†	Ilford A and C	151–154	..	5 2 4	236,476	Stk.	Mar. 12	5	Tynemouth, 5 p.c. max.	108½–109½	..	4 11 4
65,780	,,	,,	6½†	Do. B	115–118	..	5 8 0					Wandsworth, Wimbledon, and Epsom—			
65,500	,,	June 26	4	Do. 4 p.c. Deb.	92–94	..	4 5 1					Wandsworth A 5 p.c.	151–156	..	5 7 4
4,940,000	Stk.	May 14	9	Imperial Continental	150 –160	..	5 12 6	30,000	Stk.	Feb. 26	8½	,, B 3½ p.c.	129–134	..	5 2 7
1,235,000	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	84–86	..	4 1 5	255,636	,,	,,	6½	,, C 3½ p.c.	110–115	..	5 2 0
200,242	Stk.	Mar. 12	6½	Lea Bridge Ord. 5 p.c.	119 –121	..	5 7 0	108,075	,,	,,	5/17/8	Wimbledon 5 p.c.	117–122	..	5 0 5
561,000	Stk.	Feb. 26	10	Liverpool United A	211–213	..	4 13 11	352,000	,,	,,	6½	Epsom 5 p.c.	121–126	..	5 5 2
718,100	,,	,,	7	Do. B	146–148	..	4 14 7	98,000	,,	,,	6½	3 p.c. Deb. Stk.	66–69	..	4 6 11
306,083	,,	June 26	4	Do. Deb. Stk.	97–99	..	4 0 10	88,416	,,	June 26	3				

Prices marked * are "Ex Div." † Next Dividend will be at this rate.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Lady Interviewer and Demonstrator. Newcastle and Gateshead Gas Company.
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Sales of Stocks and Shares.

Dunstable Gas Company. London Mart. Oct. 20.
Felixstowe and Walton Water Company. London Mart. Oct. 6.

Sales of Stocks and Shares.—*Continued.*

Harrow and Stanmore Gas Company. London Mart, Oct. 6.
Ilford Gas Company. London Mart, Oct. 6.
Southend Water Company. London Mart. Oct. 6.
Wandsworth, Wimbledon, and Epsom Gas Company. London Mart. Oct. 20.

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